Batch Management Implementation

LISTEN.
THINK.
SOLVE.®

Allen-Bradley • Rockwell Software

Rockwell Automation

Publication Number -- Date

Copyright © 2011 Rockwell Automation, Inc.

Important User Information

This documentation, whether, illustrative, printed, “online” or electronic (hereinafter “Documentation”) is intended for use only as a learning aid when using Rockwell Automation approved demonstration hardware, software and firmware. The Documentation should only be used as a learning tool by qualified professionals.

The variety of uses for the hardware, software and firmware (hereinafter “Products”) described in this Documentation, mandates that those responsible for the application and use of those Products must satisfy themselves that all necessary steps have been taken to ensure that each application and actual use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards in addition to any applicable technical documents.

In no event will Rockwell Automation, Inc., or any of its affiliate or subsidiary companies (hereinafter “Rockwell Automation”) be responsible or liable for any indirect or consequential damages resulting from the use or application of the Products described in this Documentation. Rockwell Automation does not assume responsibility or liability for damages of any kind based on the alleged use of, or reliance on, this Documentation.

No patent liability is assumed by Rockwell Automation with respect to use of information, circuits, equipment, or software described in the Documentation.

Except as specifically agreed in writing as part of a maintenance or support contract, equipment users are responsible for:

- properly using, calibrating, operating, monitoring and maintaining all Products consistent with all Rockwell Automation or third-party provided instructions, warnings, recommendations and documentation;
- ensuring that only properly trained personnel use, operate and maintain the Products at all times;
- staying informed of all Product updates and alerts and implementing all updates and fixes; and
- all other factors affecting the Products that are outside of the direct control of Rockwell Automation.

Reproduction of the contents of the Documentation, in whole or in part, without written permission of Rockwell Automation is prohibited.

Throughout this manual we use the following notes to make you aware of safety considerations:

WARNING

Identifies information about practices or circumstances
that can cause an explosion in a hazardous environment,
which may lead to personal injury or death, property damage, or economic loss.

IMPORTANT

Identifies information that is critical for successful application and understanding of the product.

ATTENTION

Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you:

- identify a hazard
- avoid a hazard
- recognize the consequence

SHOCK HAZARD

Labels may be located on or inside the drive to alert people that dangerous voltage may be present.

BURN HAZARD

Labels may be located on or inside the drive to alert people that surfaces may be dangerous temperatures.

Contents

ABOUT THIS LAB 5
Document Conventions *6*
Tools & prerequisites *6*
Initial Checks *9*
Controller Setup SoftLogix *9*
LAB1: FACTORY TALK BATCH BASICS 29
Operator's Perspective *29*
Engineer's Perspective *70*
R&D (Recipe Author) Perspective *101*
Plant Management's Perspective - Batch Reporting *123*
Quality's Perspective - Batch Reporting *139*
LAB2: FACTORY TALK BATCH "EPROCEDURE" 159
Sample Process Overview: *159*
Sample SOP *160*
Operator Perspective: *161*
Electronic Work instructions operator view *165*
Engineering aspect *169*
Equipment Definition *169*
Procedure Definition *173*
Configuring Formula Values *177*
Configuring the transition conditions *178*
Defining the recipe flow *181*
Recipe overview *185*
Recipe Details *186*
Creating an eProcedure instruction: *191*
Displaying images on the operator instructions *208*
LAB3: FACTORY TALK BATCH " MATERIAL MANAGER" 210
Introduction *210*
Split Feeds (Tank Depletion) and Rebinding *211*
Plug Flow Transition *225*
Container Selection *229*
Inventory Check *234*
Material Management implementation with FactoryTalk Batch *238*
Solid Receiving Area *241*
Liquid Receiving Area *249*
Pre-Weigh 1 ..... *253*
LAB4: FACTORYTALK HISTORIAN SE / BATCH ANALYSIS LAB 272
Section 1 – Overview, Highlights of Lab, and Terminology *272*
Section 2 – Engineer constructs FactoryTalk Historian SE points *275*
Section 3 – Engineer's take on the FactoryTalk Batch Interface *304*
Section 4 – Engineer's perspective of ProcessBook with BatchView *325*
LAB5: LOGIX BATCH & SEQUENCE MANAGER 342
SETUP 342

Start the software and open a project *342*
OPERATOR'S PERSPECTIVE 348
HMI Visualization & Navigation *348*
LBSM Reporting *382*
ENGINEER'S PERSPECTIVE 397
Modifying the Configuration for an Existing Phase *399*
Configuring a New Phase *401*
*Connecting LBSM to the Controller **Code*** *405*
R&D (RECIPE AUTHOR) PERSPECTIVE 415
LBSM APPENDIX: 431
LBSM Sample Application *431*
FactoryTalk Batch 11.01 Features *432*

!

Before you begin

The following steps should be completed before starting the lab exercise:

1. VMware image running. The image is configured for auto logon. Should the auto logon fail and you receive the logon screen, log on to the desktop with the following credentials:
    - Username: administrator
    - Password: Rockwell1
2. For the batch FactoryTalk security users within your lab, you have the option to use the following FactoryTalk users that have no passwords assigned if you find that easier:
    - Operator username: O1
    - Supervisor username: S1
    - Engineer username: E1

About this lab

There are 5 lab options for you to select from during this session:

- Lab 1 - PlantPAx FactoryTalk Batch Basic Lab (2 hours)
- Lab 2 - PlantPAx FactoryTalk eProcedure Batch Lab (1 hour)
- Lab 3 - PlantPAx FactoryTalk Material Manager Batch Lab (1.5 hour)
- Lab 4 - PlantPAx FactoryTalk Batch Historian SE and Batch Analysis Lab (1.25 hour)
- Lab 5 – Logix Batch & Sequence Manager Lab (1.5 hour)

Labs 1, 2, and 3 use two VMWare images named PASS01 and AppSerBatch. Lab 4 requires three VMWare images which puts a real strain on this single PC, so be patient at times, please. Lab 5 only requires the PASS01 VMWare image. Time estimates for each lab have been provided, but they are simply an estimate. Please note that you may not have time to finish the lab that you desire to take within a single session. If so, please consider signing up for another session later in the week. The following are brief descriptions of the labs you may consider taking during this session:

Lab 1: PlantPAx FactoryTalk Batch Basic lab - it exposes the user to the various aspect of the FactoryTalk Batch core product from the point of view of view of different users, the operator, the supervisor and the engineer.

Lab 2: PlantPAx Factory Talk eProcedure lab – it show the user how the commonly found paper based manual operating procedures can be converted into an electronic work instructions driven procedure, this lab uses predefined generic instructions to create and execute a recipe. It shows how these instructions can be created if different ones are required.

Lab 3: Material Manager - This lab is designed to demonstrate some of the capabilities of the Material

manager component of FactoryTalk Batch. It shows how materials can be tracked from its arrival to the plant, how the tank and silo farm can be managed as well as how material can prioritize and managed for its usage in the process.

Lab 4: PlantPAx Process Information - provides a reporting and analysis solution for your process operations. Offering a multitude of client access options, time-series information can be shared with all levels of the organization providing essential data on how things are running or the ability to drill down into more detail on how a specific operational component is functioning. Integration with our data historian provides detailed historical context for further batch analysis or comparison of past performance against current running operations, past operations, and time-series data. This lab uses the new Historian Batch Event Interface.

Lab 5: Controller Base Batch Management Implementation - This section provides you with an opportunity to explore the capabilities of PlantPAx Logix Batch and Sequence Manager (LBSM) from various users' perspectives. A "day in the life" perspective of several system users (operator, engineer, R&D) will be explored to design, control, troubleshoot, and optimize a running batch/sequencing production process built leveraging the capabilities of the PlantPAx controller based solution.

Document Conventions

Throughout this workbook, the following conventions are used to guide you through the lab materials.

This style or symbol:	Indicates:
Words shown in bold italics (e.g., ***RSLogix 5000*** or ***OK***)	Any item or button that you must click on, or a menu name from which you must choose an option or command. This will be an actual name of an item that you see on your screen or in an example.
Words shown in bold italics, enclosed in single quotes (e.g., ***'Controller1'***)	An item that you must type in the specified field. This is information that you must supply based on your application (e.g., a variable). Note: When you type the text in the field, remember that you do not need to type the quotes; simply type the words that are contained within them (e.g., Controller1).
NOTE: / **Tech Tip:**	The text that appears inside of this gray box is supplemental information regarding the lab materials, but not information that is required reading in order for you to complete the lab exercises. The text that follows this symbol may provide you with helpful hints that can make it easier for you to use this product. Most often, authors use this "Tip Text" style for important information they want their students to see.

Note: If the mouse button is not specified in the text, you should click the left mouse button.

Tools & prerequisites

Software programs required:

- Microsoft Windows Server 2008 Standard R2 (64 bit) with Microsoft Internet Explorer 9.0
- Microsoft SQL Server 2008 Standard Edition
- Microsoft Office 2010
- RSLinx Classic v2.59 (CPR9 SR5)
- RSLogix 5000 v20 with Phase Manager option
- SoftLogix v20

- FactoryTalk Batch v11.01
- FactoryTalk eProcedure v11.01
- FactoryTalk Material Manager 11.01
- FactoryTalk Historian Site Edition v3.0.
- FactoryTalk Historian ProcessBook v3.2.0
- FactoryTalk Historian DataLink v4.1.1
- FactoryTalk PI Batch Interface
- FactoryTalk View Site Edition 7.0 (CPR9 SR6)
- FactoryTalk Services Platform v2.6 (CPR 9 SR6)

Hardware required for 3 images to run acceptably:

- High-end I7 processor, or better, 16GB min, high speed disk drives 10,000 rpm, or solid state.

Lab files required are listed below:

On the **PASS01 image** are the controllers (SoftLogix), and the HMI server.

PlantPAx Logix 5000 Project :

C:\PlantPAx Demo\CLX\ PlantPAx Demo Processor ACD Files
PlantPAx_Demo_Controller1_2_3_2014.ACD

C:\PlantPAx Demo\CLX\ PlantPAx Demo Processor ACD Files
PlantPAx_Demo_Controller2_2_3_2014.ACD

PlantPAx View HMI Project :

C:\Users\Public\Public Documents\RSView Enterprise\SE\HMI Projects\PlantPAx CPG HMI Server\

On the **AppSerBatch image** is the Batch Server:

PlantPAx Batch Project :

C:\Program Files (x86)\Rockwell Software\Batch\PlantPAx Demo\

Equipment\

Instructions\

Journals\

Logs\

Recipes\

Restart\

PlantPAx ProcessBook Historian –

C:\PlantPAxDemo\Historian

Initial Checks

Initial Checks

Before you begin

1. To begin, please make sure you are on **PASS01** image. You can confirm this by looking for the image name in the top banner of the VMWare Workstation (**PASS01**).

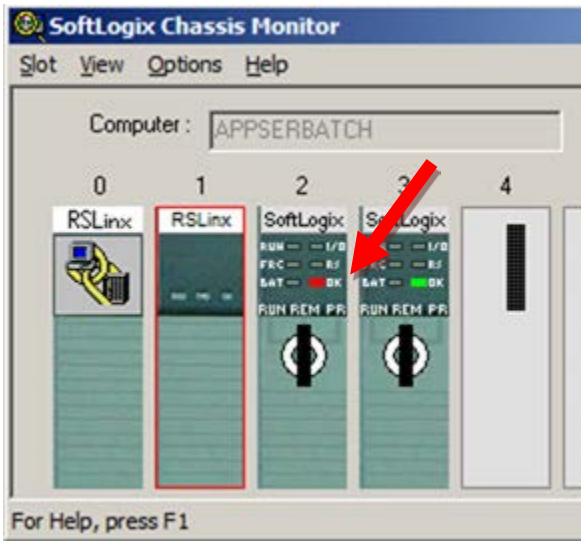
   Note: There is two, and possibly, even three images for this lab.

Controller Setup SoftLogix

1. SoftLogix v. 20 should launch with your image logged on to the desktop. Everything should be running - SoftLogix controllers, FTBatch server, eProcedure server, Batch System Status server, data server, HMI server and client, etc. There should be no faults in the controllers and the mode should be running.

   First, verify that the controller appears to be running with no faults.

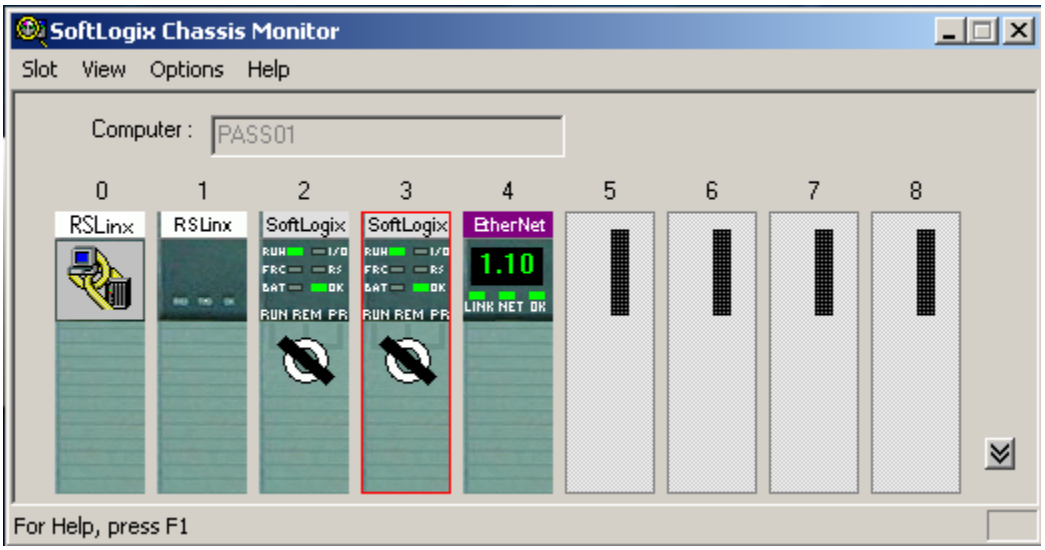
   A red light on the controller OK status indicates that a fault has occurred.



Note: If the SoftLogix controller is faulted in slot 2, you will need to use the Chassis Monitor to clear the fault and then place it into Run mode. You may clear the fault by right-mouse clicking on the faulted controller slot. Select Clear Major Faults from the task menu to clear the fault.

Initial Checks

2. Your SoftLogix controller should look like the following if no issues exist. Verify controllers are running (the green box is lite up next to RUN):



> **Note:** If the SoftLogix controllers in slot 2 and 3 are not Running, you will need to right-mouse click on each controller to place it into the Run mode. This may take a few moments to finish.

3. If your image did not boot with running applications and logged onto the desktop, please let your instructor know. This may indicate that there is a problem with your station. If another nearby station is open, you may consider moving to that station to save time. It could take about 10-15 minutes to load and boot your application software for this lab.

4. If any of your slots in the SoftLogix controller have a red X, move to step 8. If you are unsure how to rectify this issue, let your instructor know.

> **Skip Ahead: If there are no apparent problems with SoftLogix which means each controller is running, and the status on each controller is OK, and there are no Red X boxes in the chassis, please skip ahead by going to the next section called Batch Setup Checks**

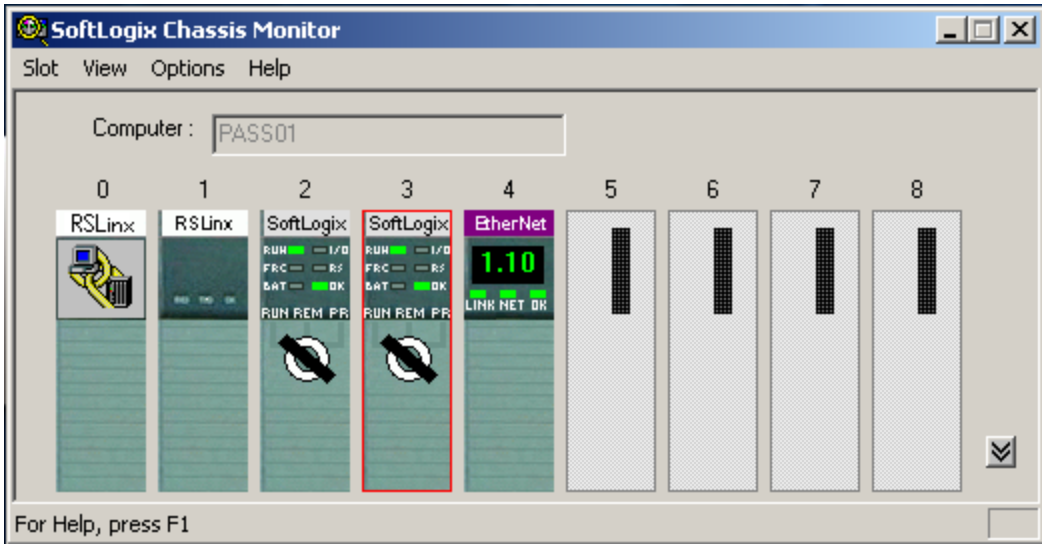
Initial Checks

5. If SoftLogix is not launched as a running application, please launch the SoftLogix controller software that will emulate Logix series controllers in the field. Please allow a few minutes for this application to startup and display. Wait several minutes for the green light next to the OK to become lite up indicating everything is OK. If there is a red X in a slot, go to step 8. A red light on the controller OK status indicates that a fault has occurred during startup. You will need to clear the fault and place the controller into Run.

6. Place the controllers into Run mode by right mouse clicking on a controller slot and selecting RUN:

7. It should look like this:

Initial Checks



8. If there is a red X in either controller slot, you will need to remove the slot and then add it back again. You will also have to load the controller software to the appropriate controller slot. Got to the next section for loading and setting up the controller, if needed.

9. It may take a few minutes for SoftLogix to load. If there no slots with a red X, try to place the controller into Run mode. Select the controller and right-mouse click the RUN menu option.

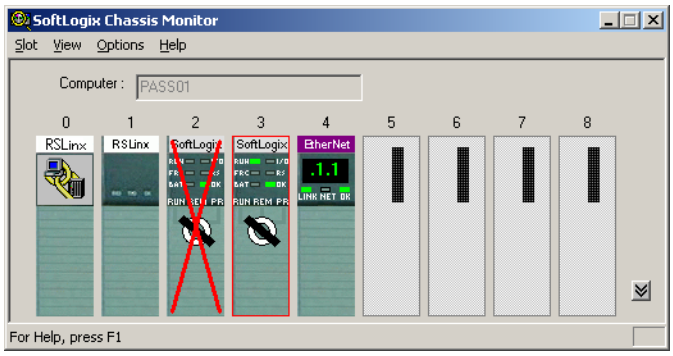
Initial Checks

Loading the Controller:

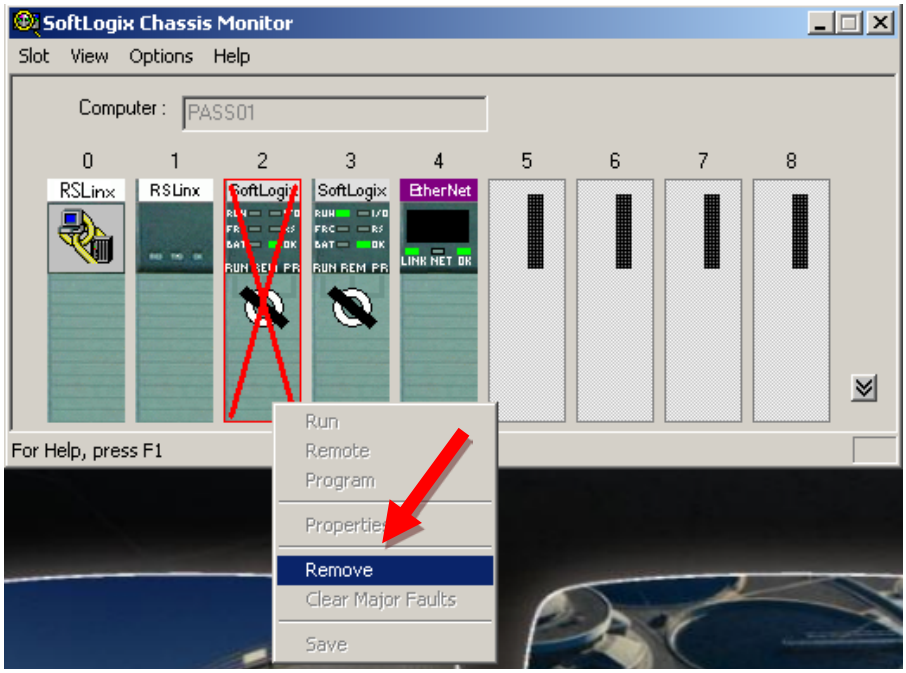
Skip Ahead: If there are no apparent problems with SoftLogix which means each controller is running, and the status on each controller is OK, and there are no Red X boxes in the chassis, please skip ahead by going to the next section called Batch Setup Initial Checks.

The next section only describes fixing controller or EtherNet slot failures.

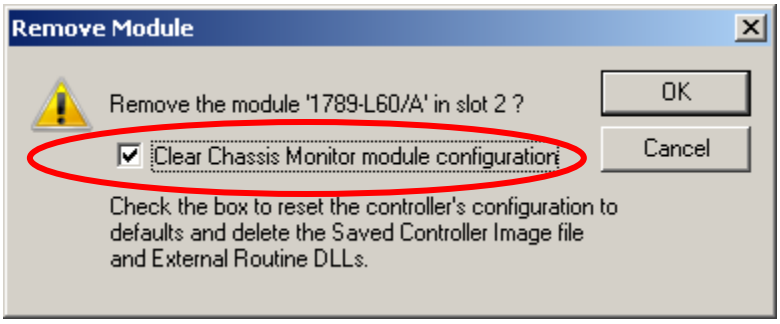
1. First we will show you how to fix a controller slot failure. Next we will show you how to fix an EtherNet slot failure. A red X in the controller slot means there was a problem. Follow this section for how to resolve a red X in the controller as shown here for slot 2:



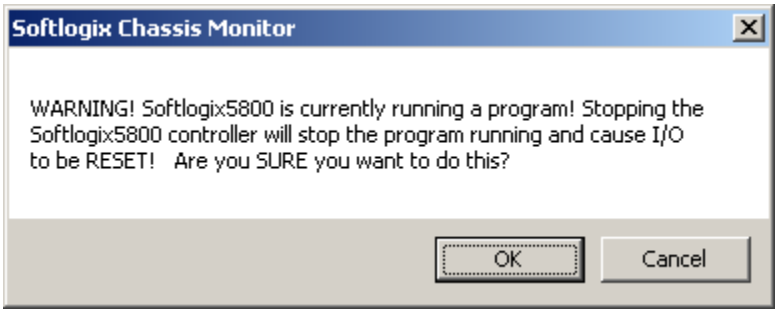
2. Select the controller with the red X, then right-mouse click to remove it.



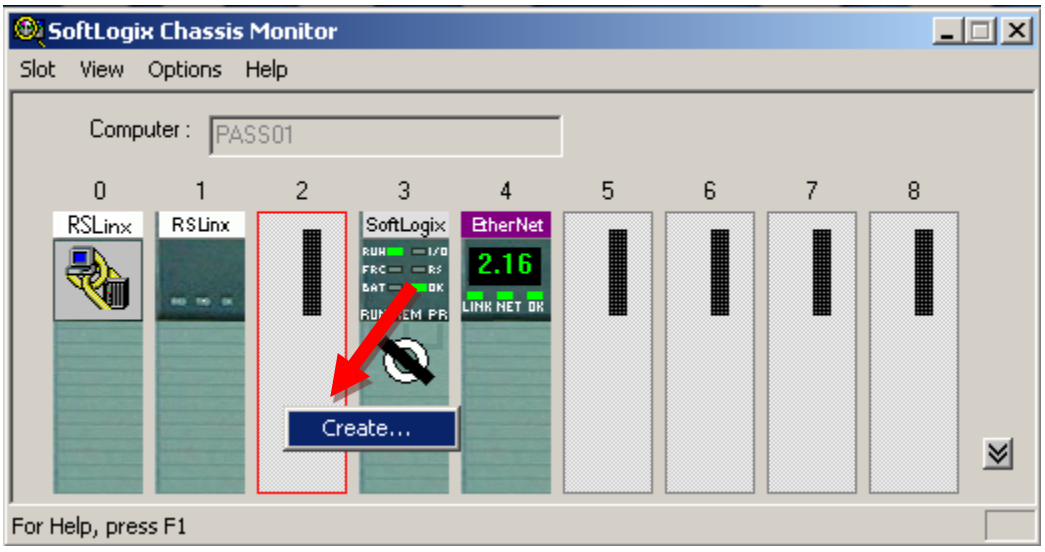
3. The Remove Module window appears, please check the ***Clear Chassis*** checkbox and select ***OK***.



4. The warning message appears, select ***OK***.

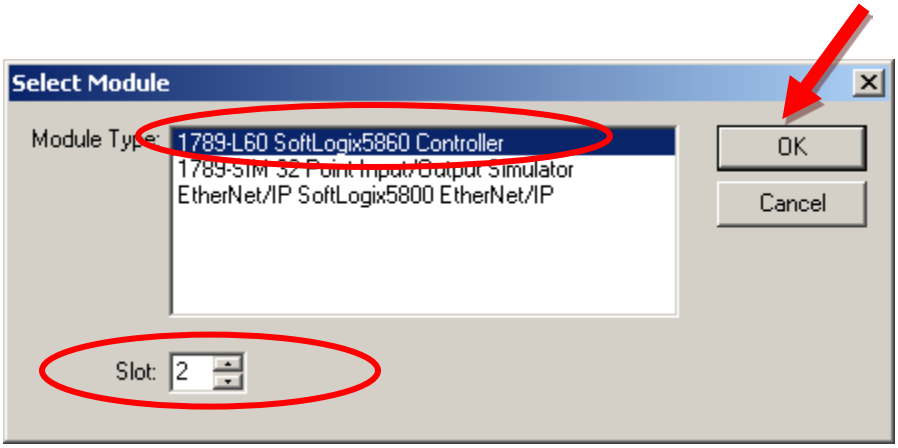


5. Select the empty slot that was removed and right-mouse click to ***Create*** a new module.

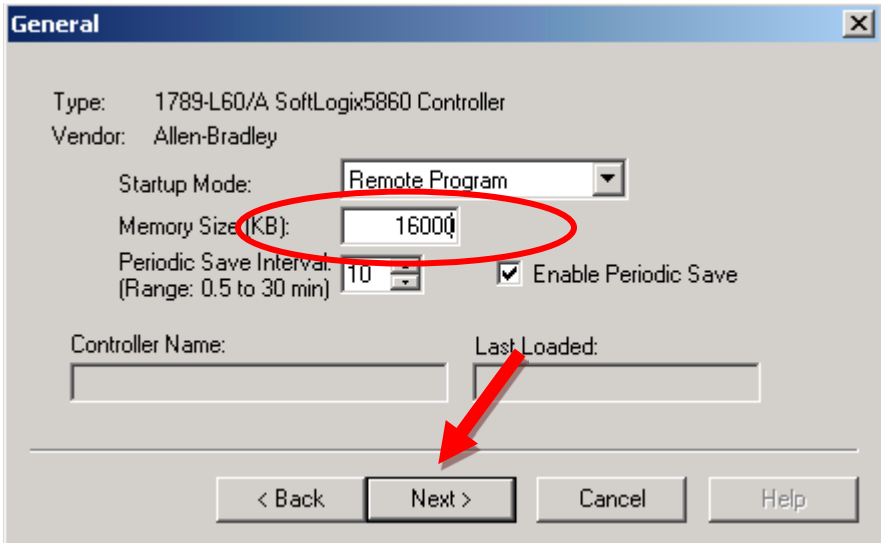


Initial Checks

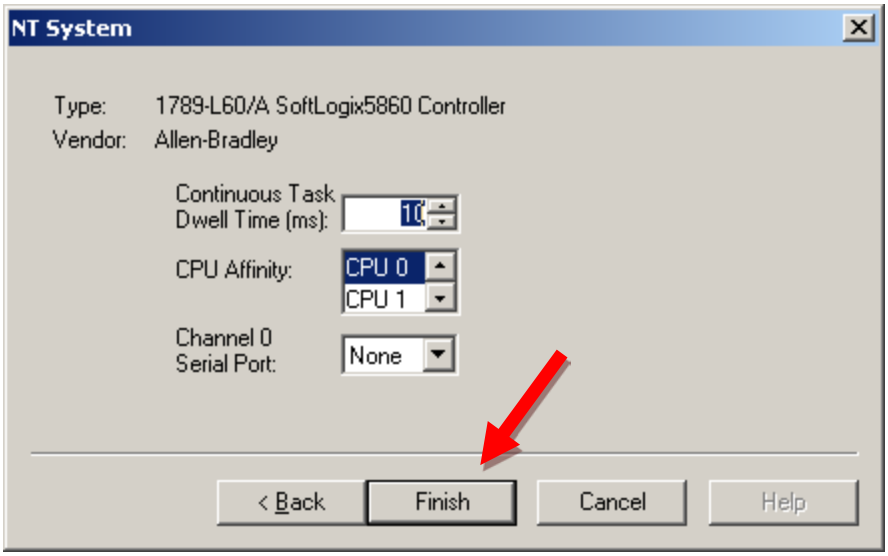
6. Follow the wizard to create a new controller whether slot 2 or slot 3. For this example we are showing slot 2 only. Do the same for slot 3 if needed. Select ***OK***.



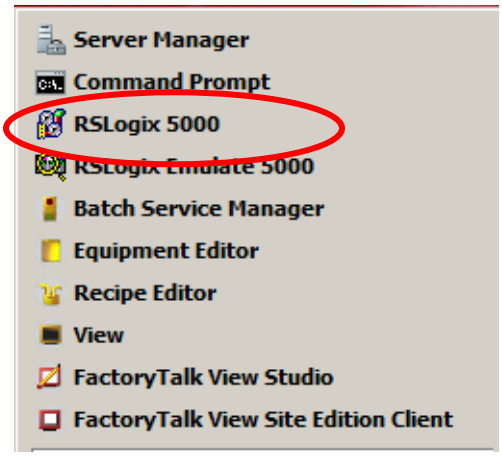
7. In the General window, change the ***Memory Size to 8192***, then select ***Next***.



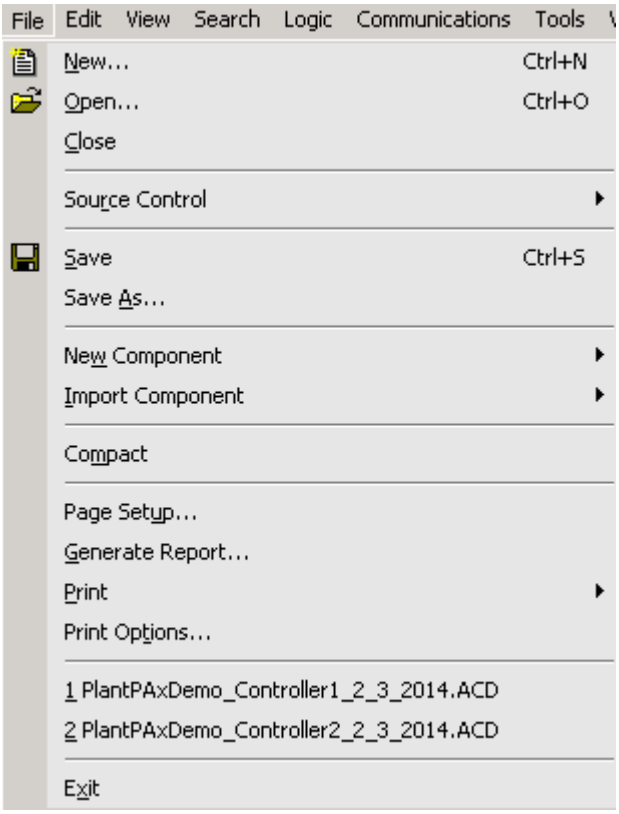
8. Take the default on NT System window, and select ***Finish***.



9. From the start bar, launch RSLogix5000, ***Start > RSLogix 5000***.



10. Open the appropriate .ACD file for either Slot 2 (Controller 1) or Slot 3 (Controller 2). For this example we are choosing Controller 1 for Slot 2.

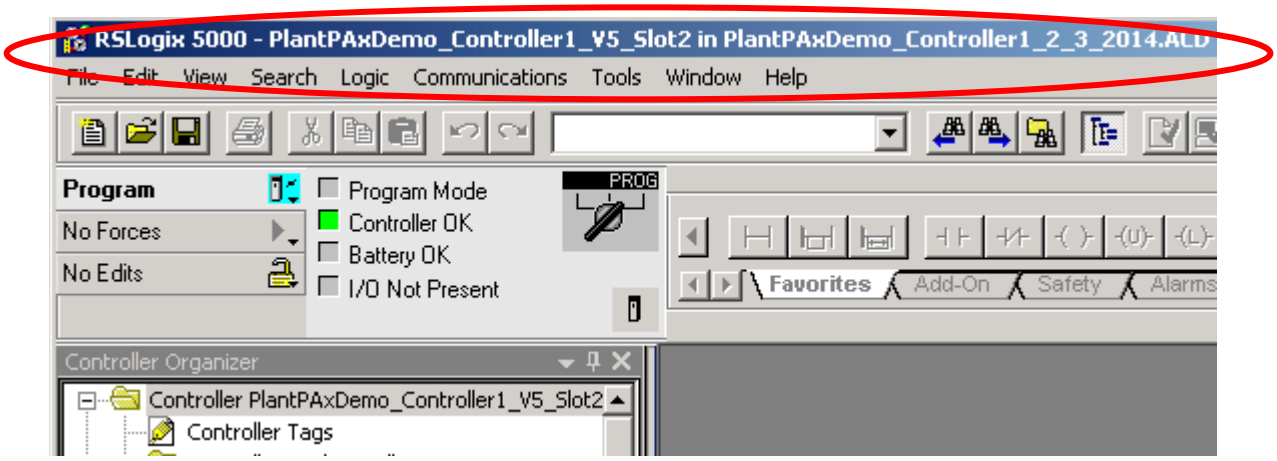


11. Select ***PlantPAxDemo_Controller1_2_3_2014.ACD*** control file from ***File*** menu under the recent open listings, or use ***File>Open*** menu and browse to "***C:\PlantPAx Demo\CLX\ PlantPAx Demo Processor ACD Files \"*** folder to select the ***PlantPAxDemo_Controller1_2_3_2014.ACD*** file.

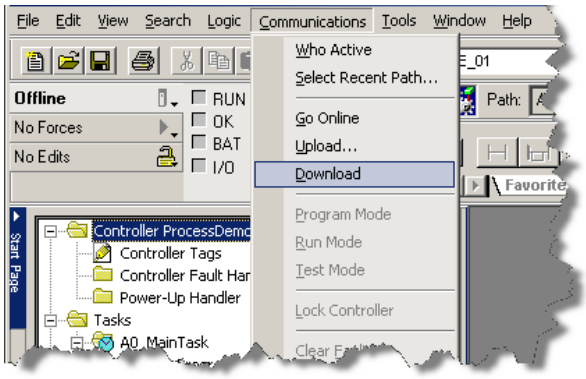
    For Controller 2 in Slot 3 you would use PlantPAxDemo_Controller2__2_3_2014.ACD

12. Please verify that you opened the correct ACD file for the correct controller. Observe the RSLogix 5000 title bar to verify that the proper file was opened as shown:

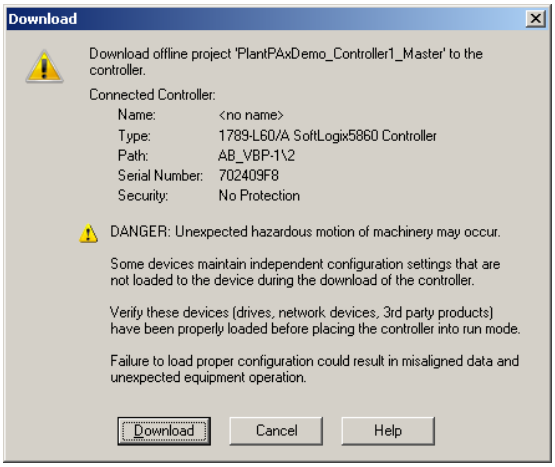
Initial Checks



13. From the communications menu, select ***Communications > Download***.

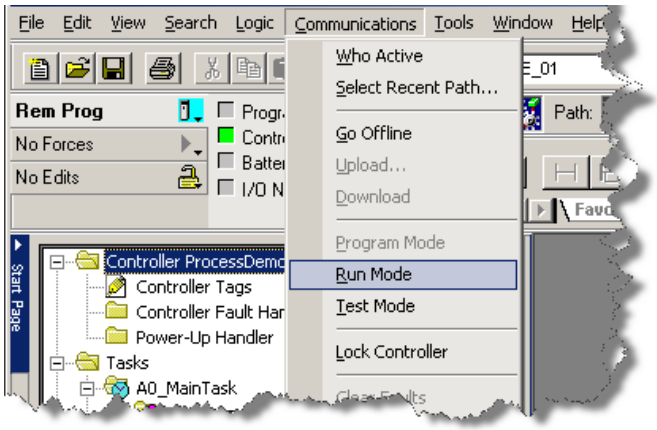


14. Select ***Download***

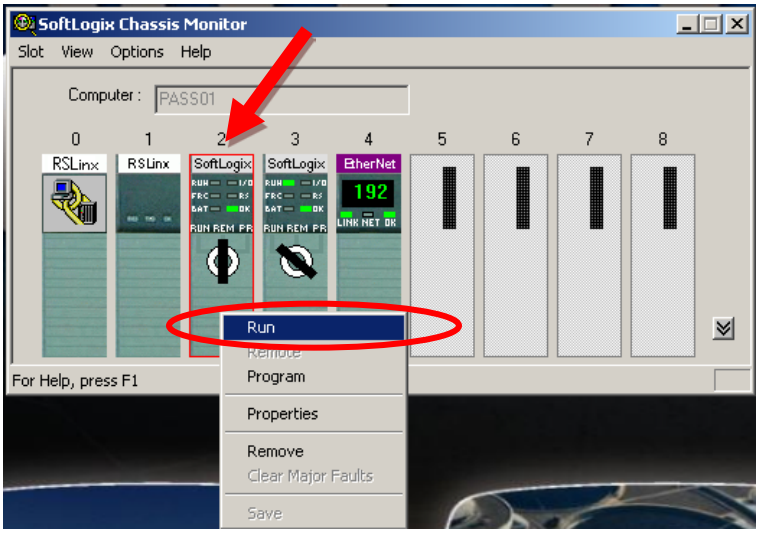


15. From the communications menu, select ***Run Mode***.

Initial Checks

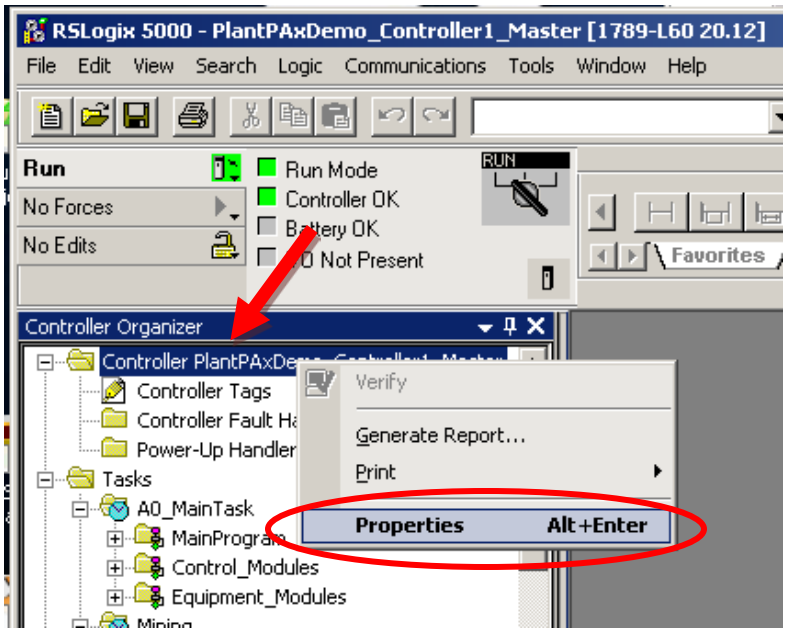


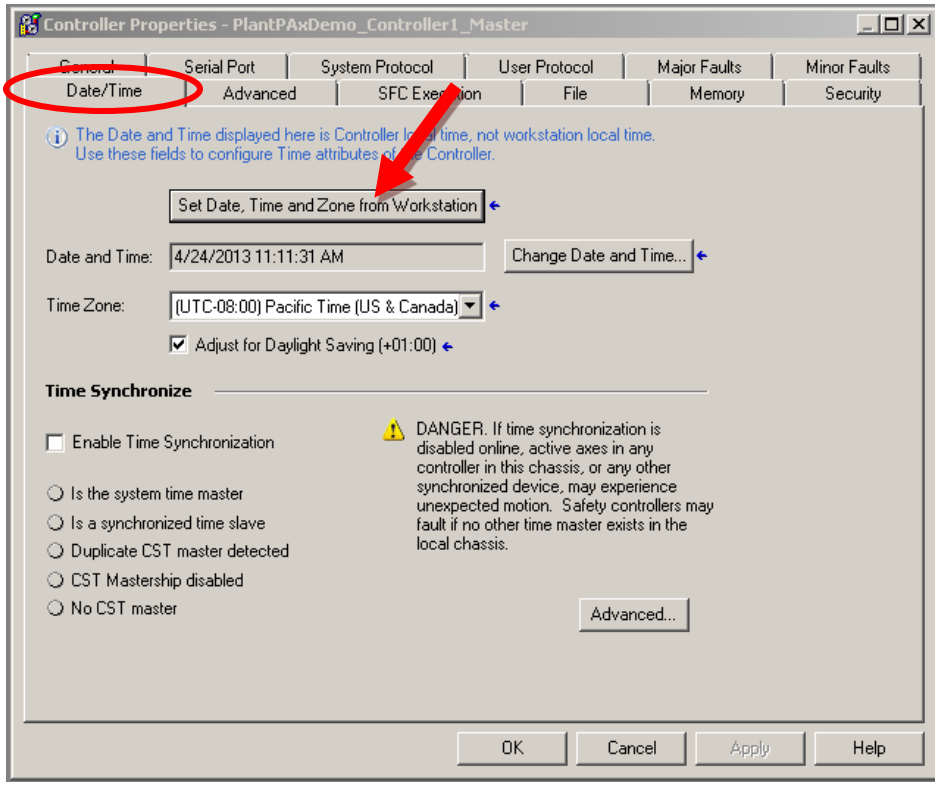
Another way to place the controller into Run is by selecting the controller within SoftLogix. Right-mouse click the controller slot to display the menu for options to set into RUN mode.



16. In RSLogix 5000, right-mouse click on the controller to edit ***Properties***, select the ***Date/Time*** tab.

Initial Checks



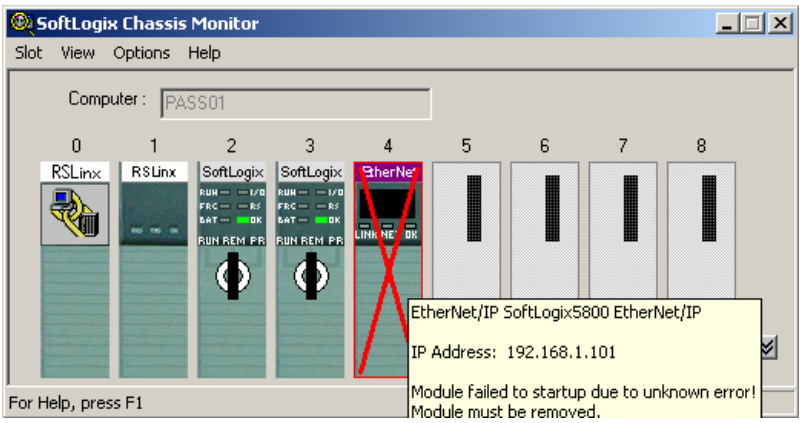


17. Select the ***Set Date, Time and Zone from Workstation***; select ***OK*** to close the Properties window.

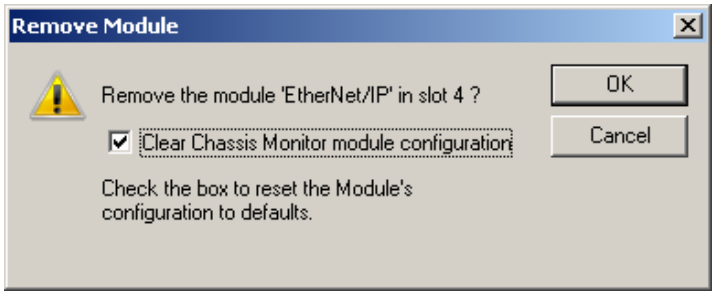
18. ***Minimize*** RSLogix5000.

19. Repeat these steps for the other controller only if it is needed due to a red X.

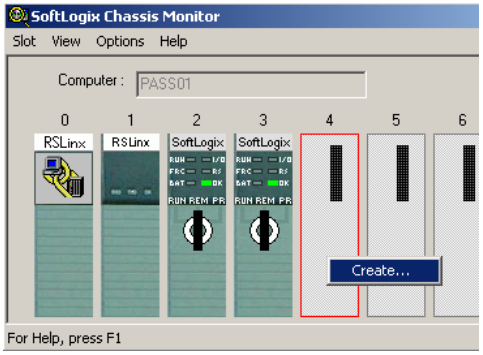
20. If your controller's EtherNet card has failed due to a red X, it will look like this:



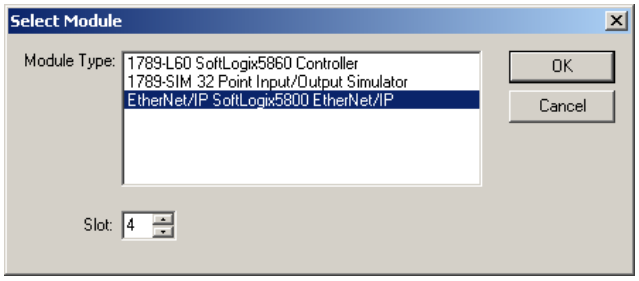
21. Right-mouse click the failed slot to ***Remove***. Please ***Check "***Clear Chassis Monitor module configuration" and then select ***OK***.



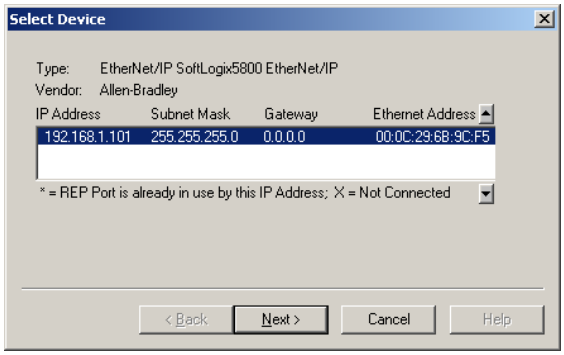
22. Right-mouse click the empty slot to ***Create*** a new module.



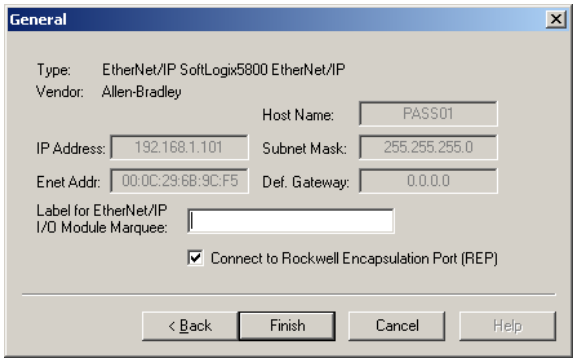
23. Select the ***EtherNet/IP*** type for slot 4, select ***OK***



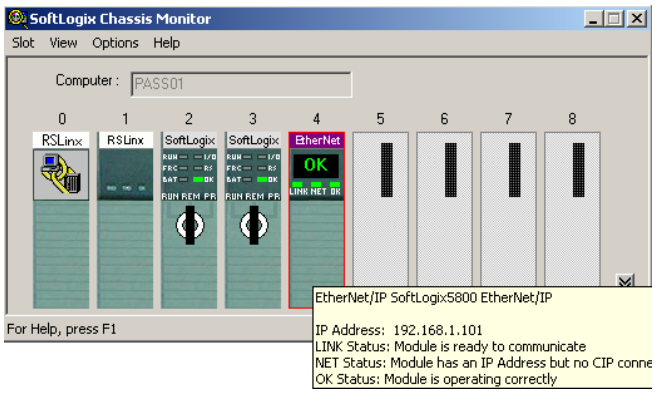
24. Select ***Next***,



25. Select ***Finish***



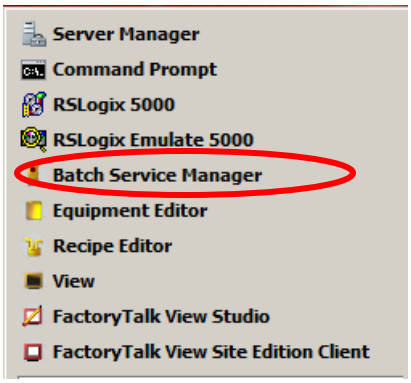
26. Verify that EtherNet indicator status is ***OK***.



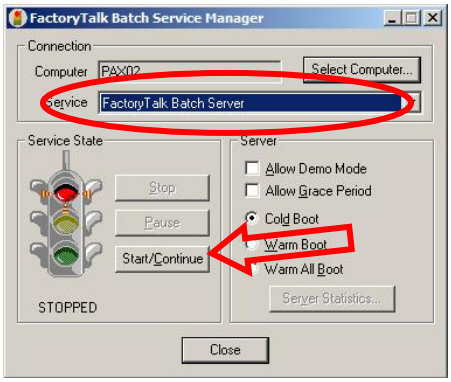
Initial Checks

Batch Setup

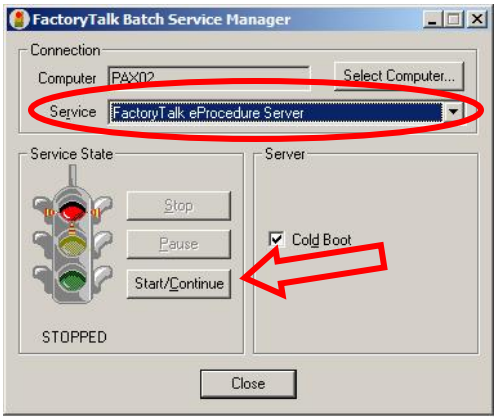
1. Your two controllers should be running without faults. From the Start menu open Batch Service Manager, select ***Start > Batch Service Manager***.



2. From the Batch Service Manager drop-down, select ***FactoryTalk Batch Server*** service and press the ***Start/Continue*** button. (If currently running, first stop, and then restart)



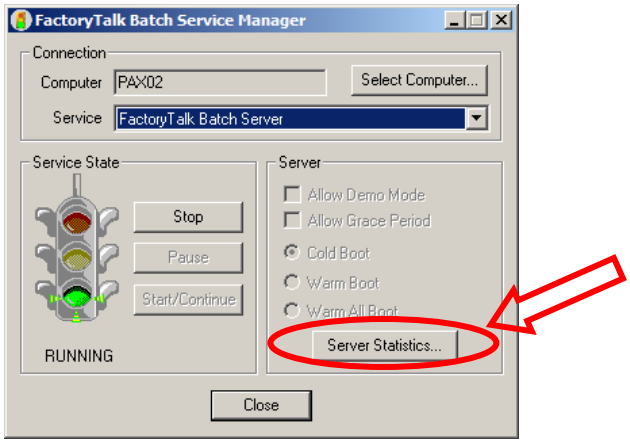
3. From the Batch Service Manager drop-down, select ***FactoryTalk eProcedure Server*** service and press the ***Start/Continue*** button. (If currently running, first stop, and then restart)



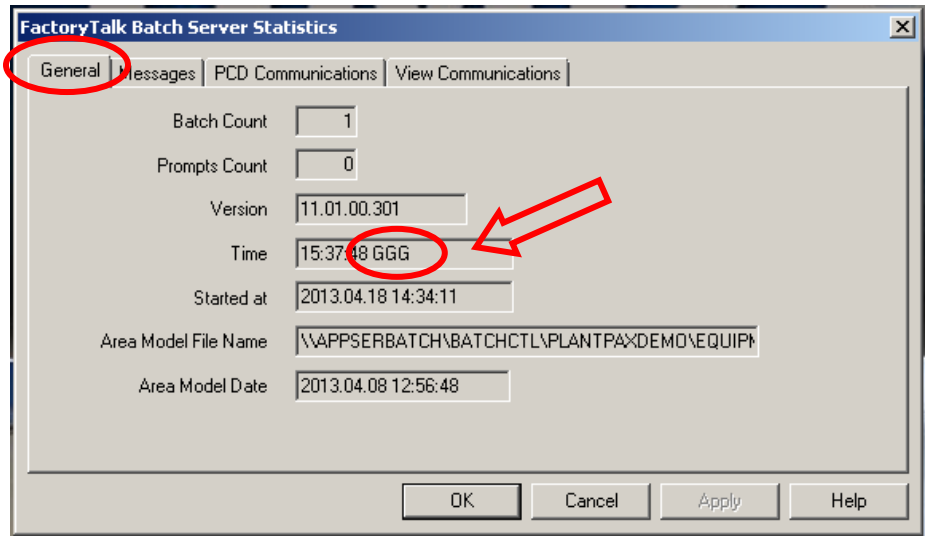
Initial Checks

4. When the eProcedure traffic lights turns green, re-select ***FactoryTalk Batch Server*** service, and select the ***Server Statistics***

button.



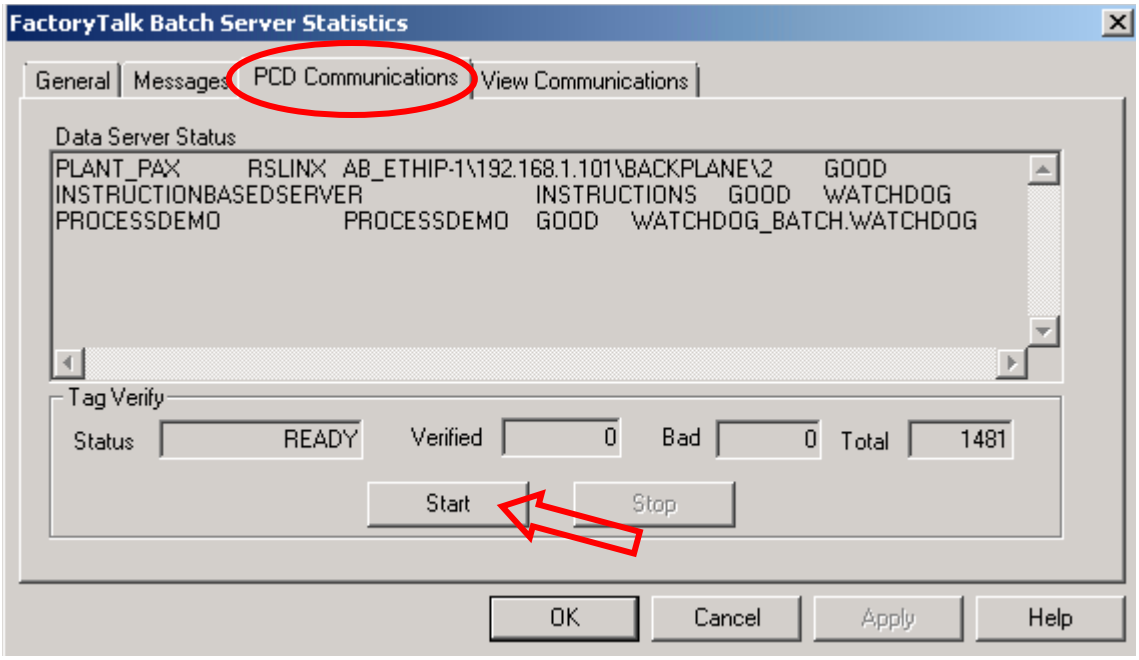
5. The server statistics window will open. The ***General*** tab will show you the status of the three data servers configured in the area model as well as other information. **GGG** indicates that all 3 data servers configured for this area model have a Good status.



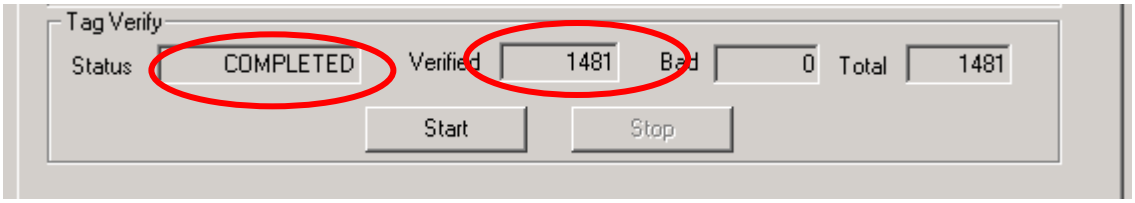
6. Select the ***PCD Communications*** tab, press the ***Start***

button to verify all tags.

Initial Checks



7. Confirm that tags verify Status is Complete and there are zero bad tags.

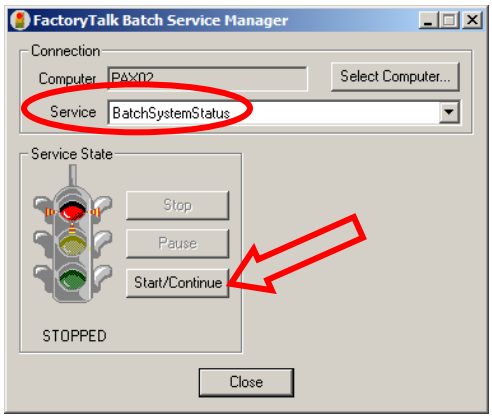


Note: If bad tags exist, you will need to stop and restart the batch server service. Inform your instructor that there was a problem. Please verify tags again once communication is GOOD. You want 0 bad tags before moving on in the lab or you will have problems

8. Select the ***Cancel*** button to close the Server Statistics window.

9. From the Batch Service Manager drop-down, Select ***BatchSystemStatus*** service and press the ***Start/Continue*** button. (If currently running, first stop, and then restart)

Initial Checks



10. When the BatchSystemStatus light turns green, ***Close*** the Service Manager.

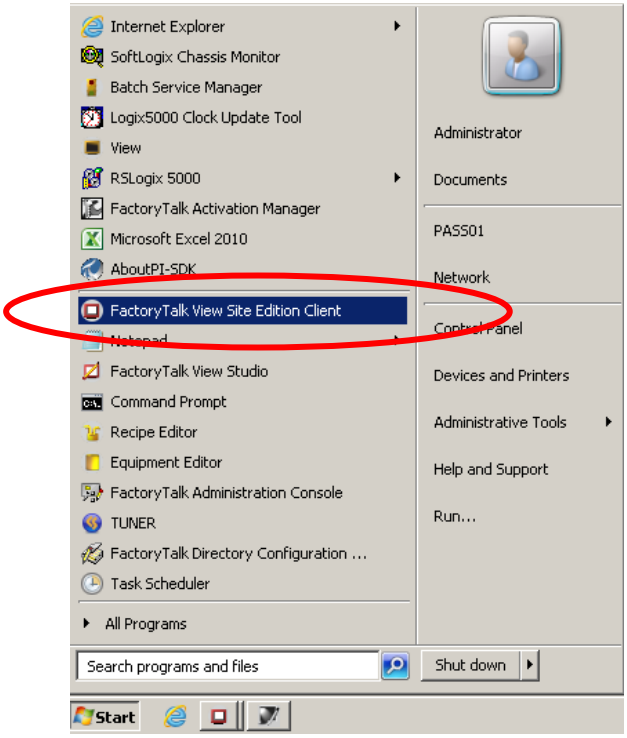
Batch System Status

The Batch System Status service is a PlantPAx tool used to move important batch server data into the controller. This application can be found on the Rockwell Automation Knowledgebase “Answer ID 62366 – PlantPAx Table of Contents”. Additional information on its use can be found later in this lab.

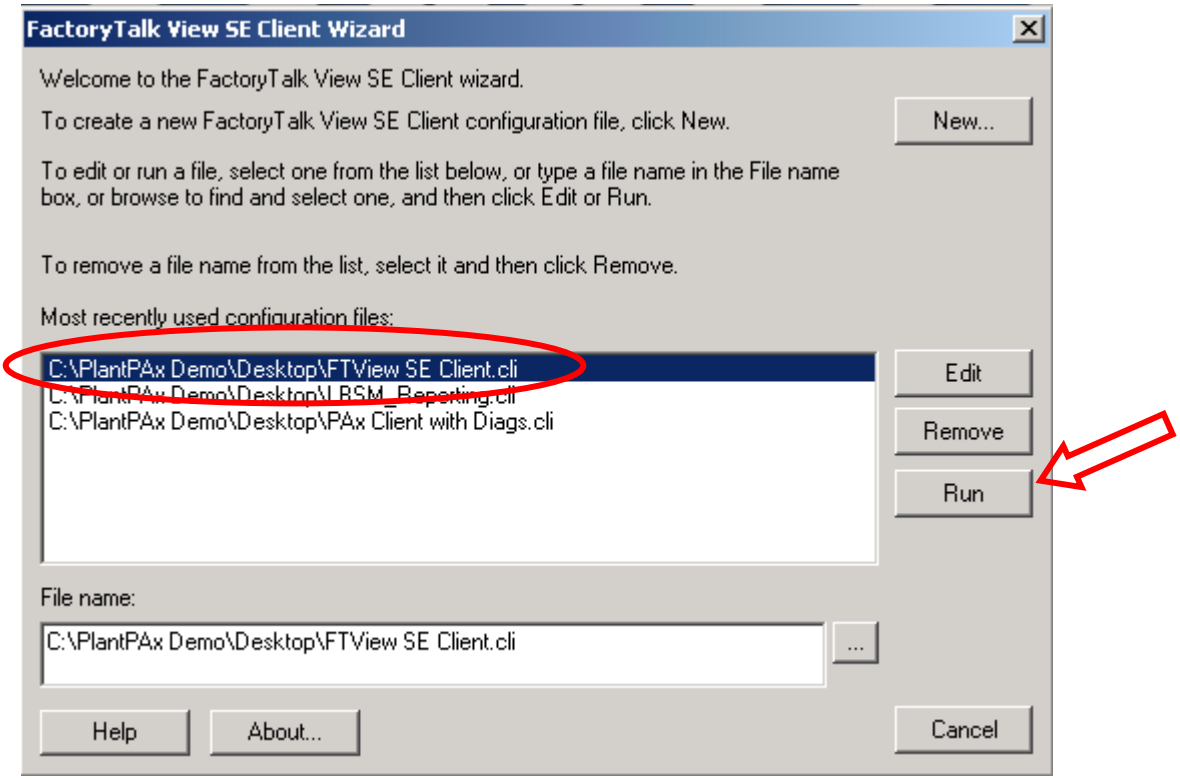
HMI Setup - Client

1. On the PASS01 image, there is an icon located on the desktop,

, please double click to launch the SE Client Wizard, or another alternative is to launch from the Start menu - ***Start > FactoryTalk View Site Edition Client*** and do step 2, if the HMI client is not already running.



2. In the **FactoryTalk View SE Client Wizard** dialog select the "***FTView SE Client.cli"*** client file in the Most recently used configuration files:



Press the ***Run*** button.

3. Wait while the HMI Client starts up. When the main screen is displayed, you may proceed.

4. Start up is now complete. Begin your desired lab section.

Lab 1: Factory Talk Batch "Basics"

Lab1: FactoryTalk Batch "Basics"

Lab1: Factory Talk Batch Basics

Operator's Perspective

This is Lab 1 of 5 possible labs that you could take. This lab starts with a focus on the operator's perspective of S88 FactoryTalk batch. You will be exposed to a manufacturing facility via the PlantPAx HMI graphics and navigation displays. This section will take you through the process of browsing master recipes, creating and commanding control recipes, and observing the S88 components of the batch. While the batch is running, you will have a chance to explore the different integrated views of the system as well as interact with the batch through standard operator tasks. These include: completing manual additions, following electronic work instructions, performing signature signoffs, changing runtime set point values, adding comments into the batch record, and much more.

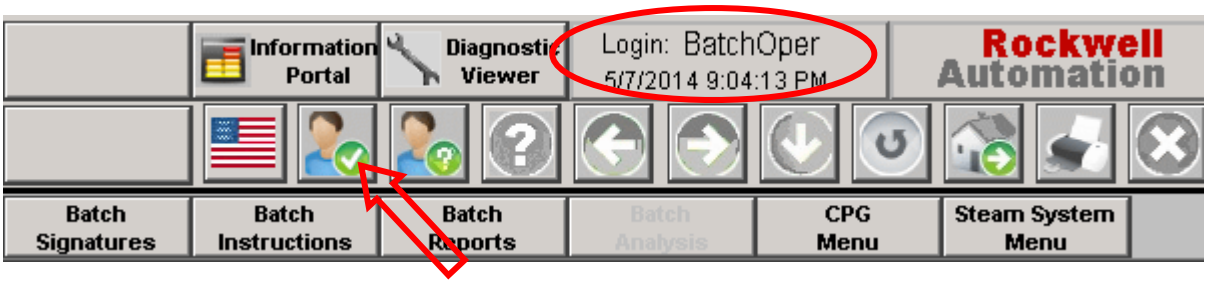
To start this lab we will get you familiarized with the PlantPAx HMI interface that we built for this lab and demo. While the demo software is not available for download, most of the components that we used for building this demo are available for download such as the PlantPAx library graphics, and controller code components.

Lab 1: Factory Talk Batch "Basics"

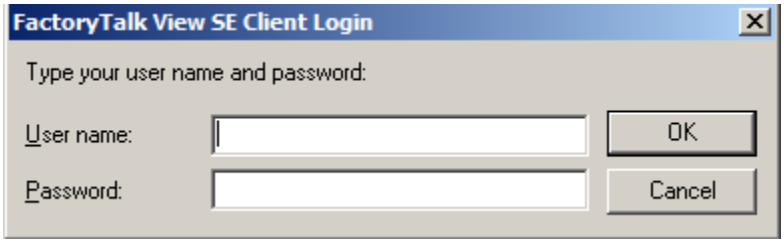
HMI Visualization & Navigation

Security & Login

1. From the SE Startup Display, please change the logon user to BatchOper by selecting the ***Login*** button, in the upper right quadrant of the display.

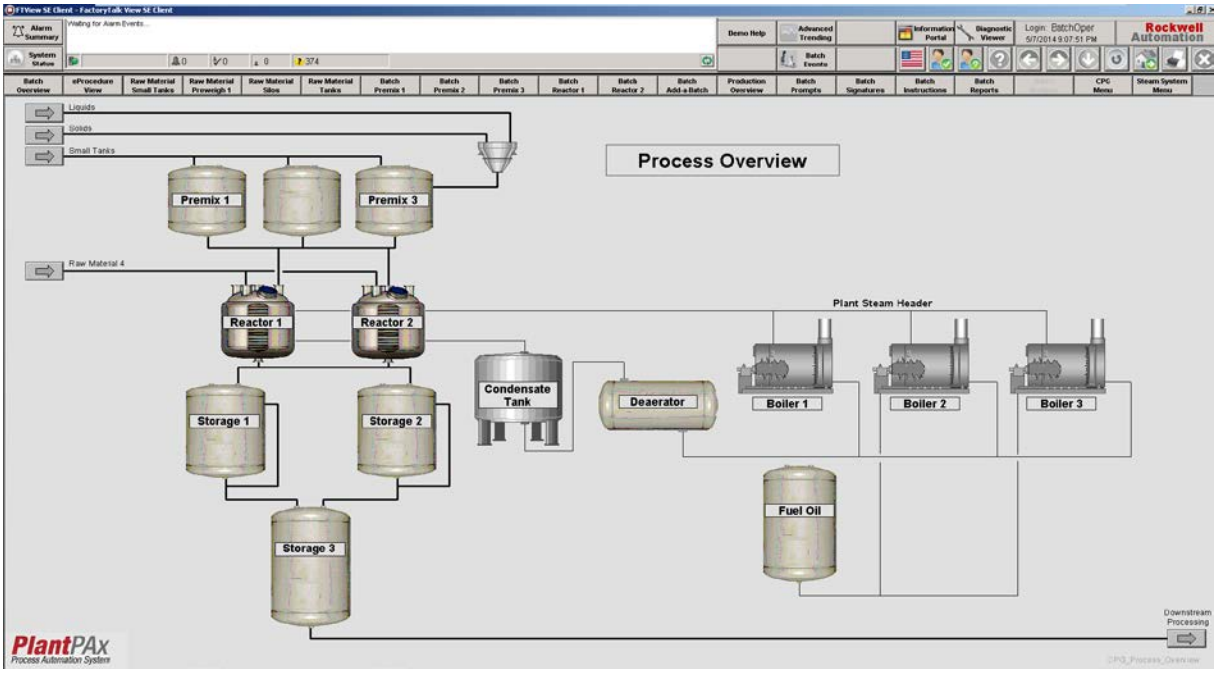


2. At the login window, type User name = '**BatchOper'** with the Password = '**Operator**' and **click *OK***. For those that don't like to type, use the shortcut User name (e.g. letter O, number 1) = '**O1**" with no password.



3. This will cause the SE graphic display to automatically change to the CPG section of this Demo as shown below:

Lab 1: Factory Talk Batch "Basics"

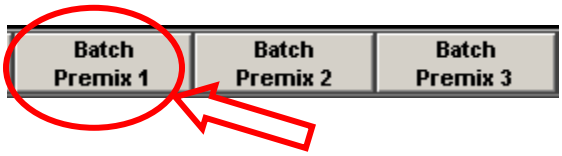


Lab 1: Factory Talk Batch "Basics"

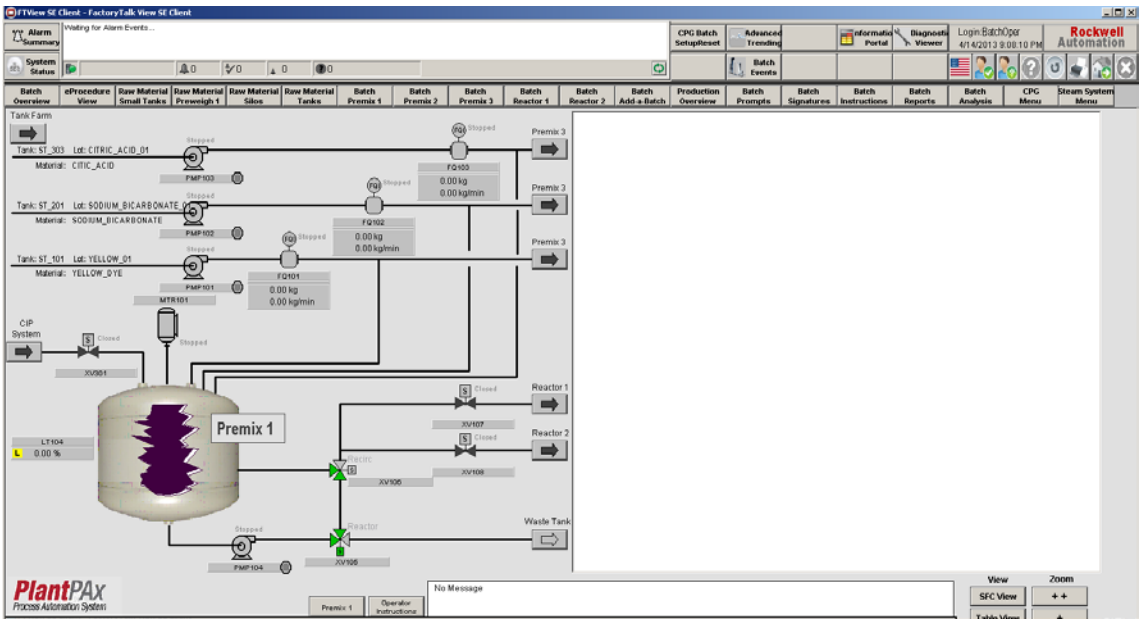
HMI Application

In this section you will familiarize yourself with the basic HMI displays for the batch process.

1. The Process Overview display shows all the major equipment components and units for the batch process. There are buttons on the navigation bar that will take you quickly to areas of interest. Take some time now to look at the three premix unit displays. Select the ***Batch Premix 1*** button:

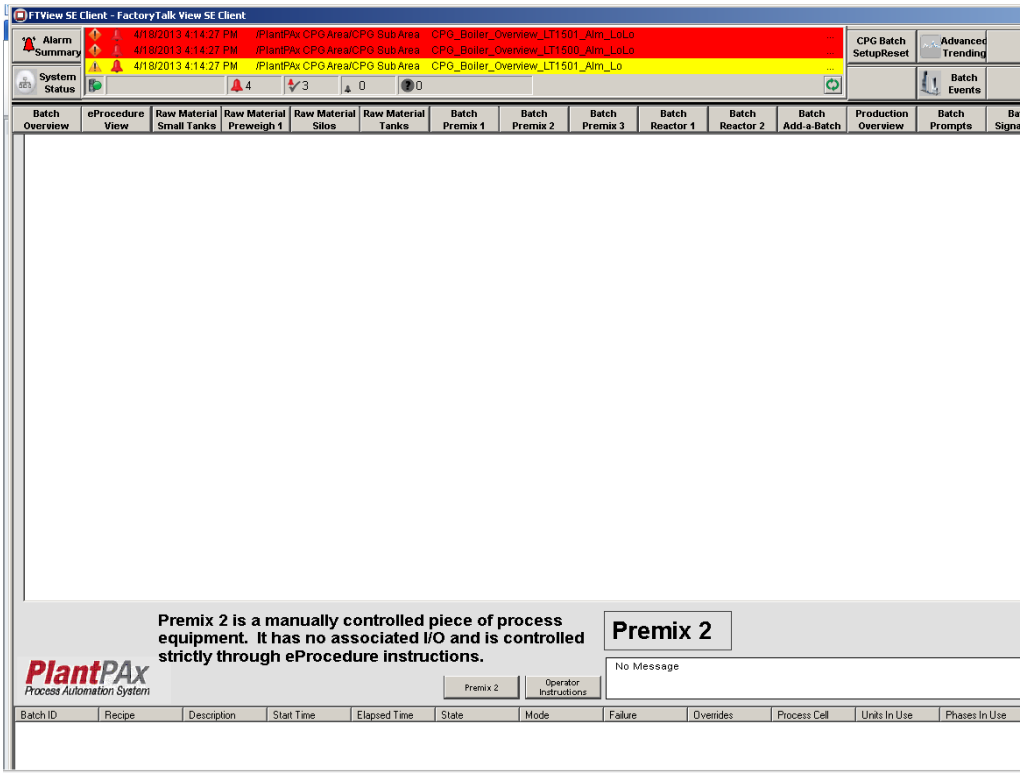


2. The "Premix 1 Process Display" appears



3. Use the navigation bar to view ***Batch Premix 2*** which is not an automated unit. The tasks performed in this unit are all performed manually by field operators. Fortunately, we have a component of the Factory Talk Batch product that allows you to make your manual batching S88 compliant with structured recipes following SOPs, electronic batch records for complete paperless record archive, manual batch reporting, electronic security and signatures. This can be combined with material manager for a comprehensive manual batch solution including material tracking.

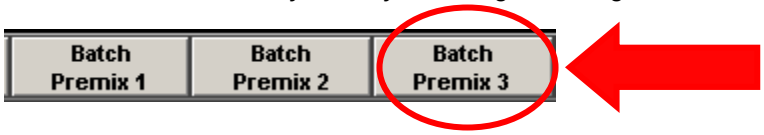
Lab 1: Factory Talk Batch "Basics"



Manual Batch Process – There is no automated equipment

The PlantPAx batch system display shows no process equipment for the Premix 2 unit. None of this equipment in this unit has been automated. All batching for this unit is done by direct operator interaction. Prior to our eProcedure product, operators would use clipboards and sheets of paper to capture their batch information. Now, it can all be done electronically with more accuracy, better standardization and security, greater speed and higher efficiencies.

4. Continue to view the system by selecting the navigation bar buttons for ***Batch Premix 3***:



5. Notice the navigation bar is completely full of different buttons. This is called the Batch System menu. The previous menu we will call the CPG menu bar.

Lab 1: Factory Talk Batch "Basics"

Batch System Menu bar:

Batch Overview	eProcedure View	Raw Material Small Tanks	Raw Material Preweigh 1	Raw Material Silos	Raw Material Tanks	Batch Premix 1	Batch Premix 2	Batch Premix 3	Batch Reactor 1

and

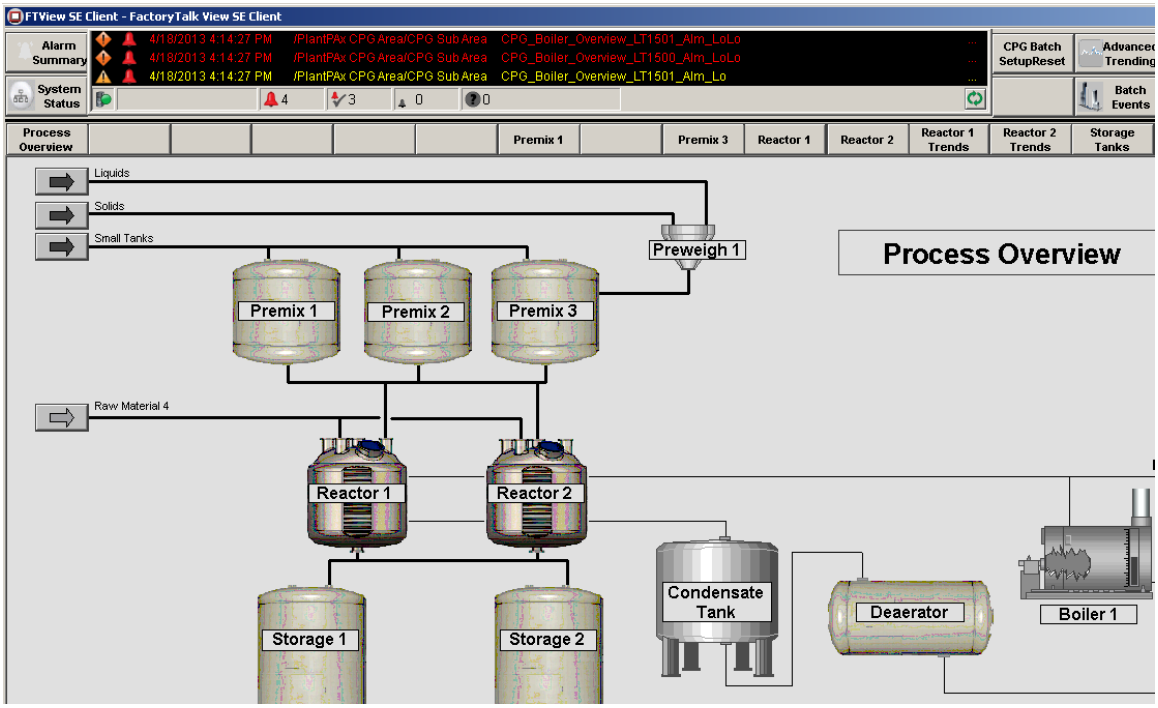
Batch Reactor 2	Batch Add-a-Batch	Production Overview	Batch Prompts	Batch Signatures	Batch Instructions	Batch Reports	Batch Analysis	CPG Menu	Steam System Menu

6. Choose the appropriate buttons to investigate the following process equipment and units:

   a. ***Reactor Area (Reactor 1 & Reactor 2)***

   b. ***Raw Material Small Tanks, Pre-Weigh, Silos and Tanks***

7. There is another way to get to the batch units (*Premix, Reactor, etc*.). It is through the ***Process Overview*** display shown here:



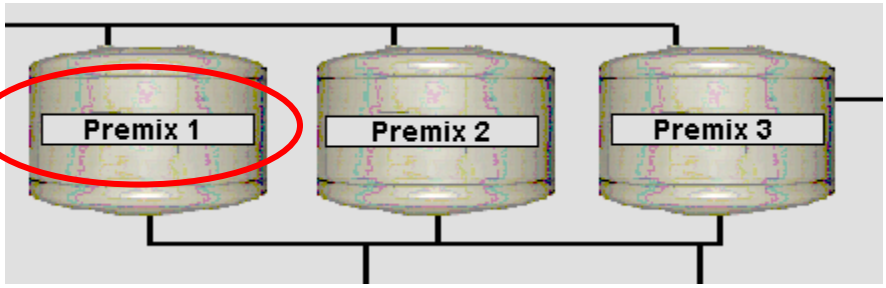
8. How do you get to this Process Overview display? Through enabling the CPG Menu navigation bar. Notice there is a ***CPG Menu*** button on the Batch System menu bar, select it. The following CPG navigation bar will appear:

CPG Menu:

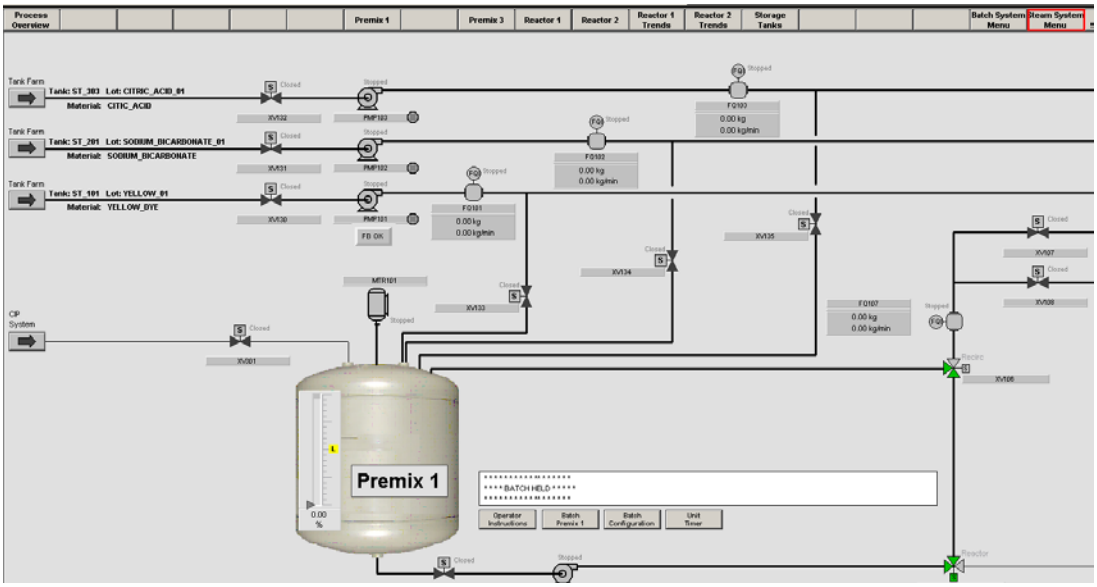
Lab 1: Factory Talk Batch "Basics"

and

9. Select the ***Process Overview*** button at the far left to get the display. To go to a specific unit display, simply select the unit graphic such as ***Premix 1***,

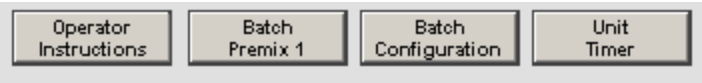


10. Something to notice about this display, it is a larger process display than what you saw earlier for Premix 1 using the Batch System menu. This display does not initialize with the integrated batch graphics for examining, controlling, and commanding recipes.



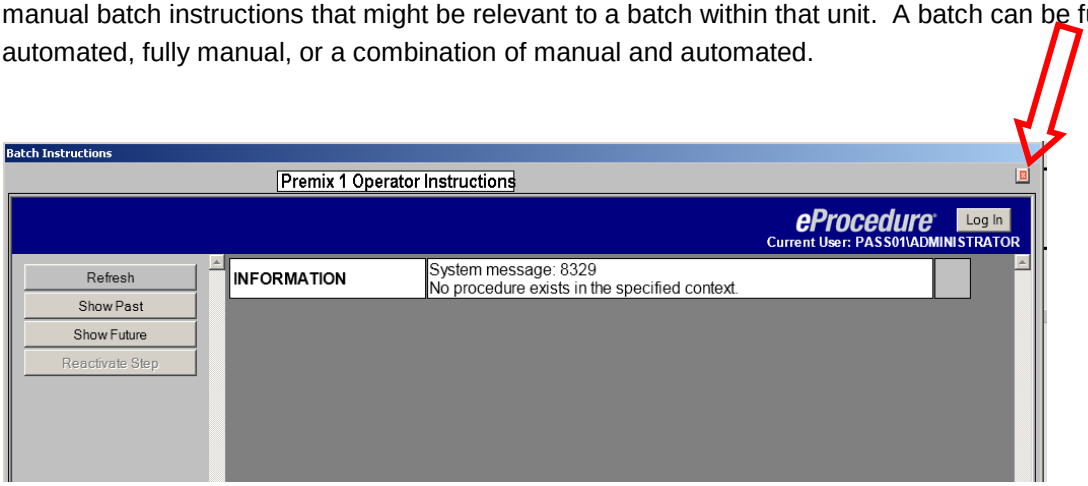
11. Next to the Premix 1 unit graphic, there should be a batch interface area to allow you to display more batch interface functionality. Please locate these buttons on the graphic:

Lab 1: Factory Talk Batch "Basics"



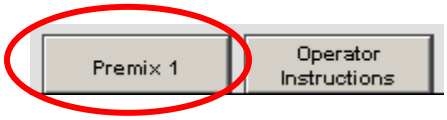
Note: These buttons will not be present if your batch server is not running. If this is your situation, please start the batch server.

12. The ***Operator Instructions*** button displays the instruction page provided by eProcedure for manual batch instructions that might be relevant to a batch within that unit. A batch can be fully automated, fully manual, or a combination of manual and automated.



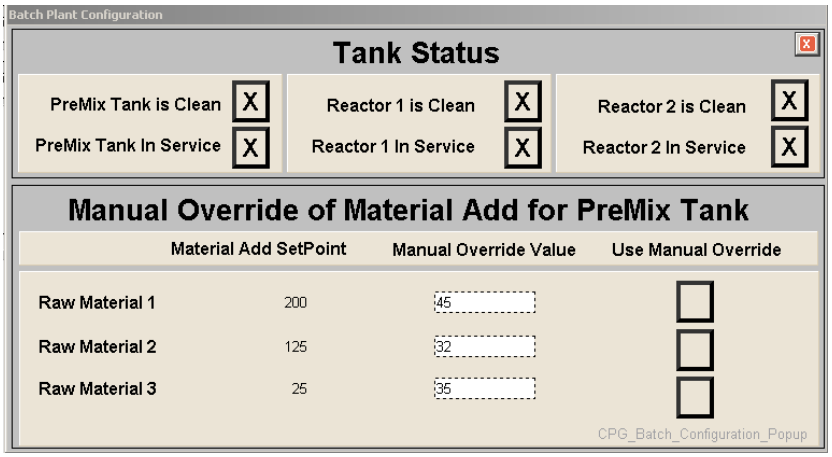
Note: To close the Batch Instruction window, select the red X checkbox at the upper right-hand corner of the window.

13. The ***Batch Premix1*** button displays the main interfaces for commanding a controlling a recipe. Once selected, in order to return to the full size Premix display, select the ***PreMix 1*** button.



14. The ***Batch Configuration*** button allows you to quickly set specific criteria for some of the batch process equipment. The Tank Status popup window appears.

Lab 1: Factory Talk Batch "Basics"



Close the window by selecting the red X at the upper right-hand corner.

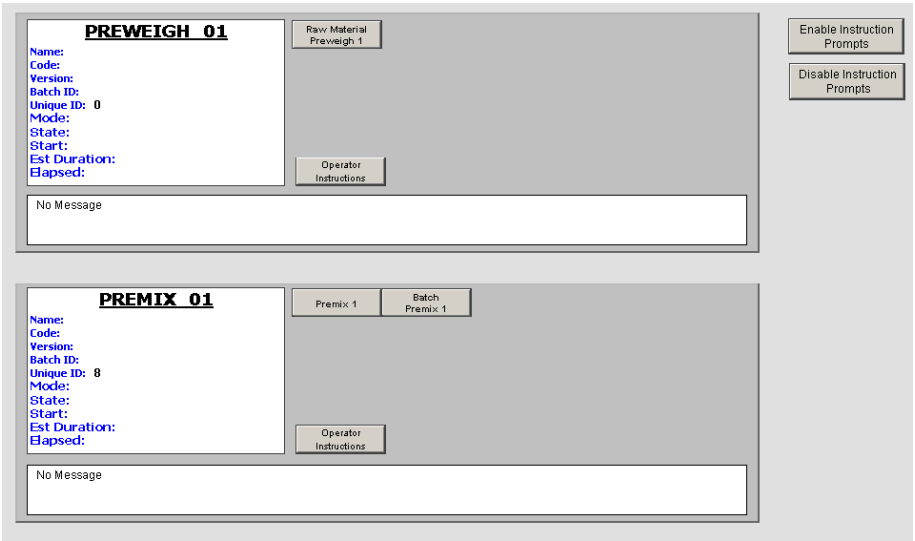
15. The ***Unit Timer*** button displays any timer information that may be running for a control recipe within the unit. The timer equipment phase data will not be present, since no control recipes are being processed by this unit.

16. If you are still showing the CPG menu navigation bar, please change to the Batch System menu navigation bar by selecting the ***Batch System Menu***

button.

17. On the Batch System menu navigation bar, select the ***Production Overview*** button

to display details about any batches in the unit equipment including Preweigh tanks, Premixers and Reactors.



Lab 1: Factory Talk Batch "Basics"

The Production Overview display will open. This screen highlights key information for each unit vessel as well instruction prompts if enabled. When you execute batches later in this lab, you will return to this screen for system wide updates. This data is provided through the service that was started earlier in the lab called Batch System Status.

PlantPAx Batch System Status

The PlantPAx batch system status application collects runtime data from the batch server and downloads directly to pre-defined Logix controller data structures. This data is then displayed through pre-build FactoryTalk View "Global Objects". This screen contains no custom VBA scripting.

18. Another important function on this display is the feature to enable instruction prompts notification. Select the ***Enable Instruction Prompts***,

to set orange background "?" question marks as signals when a manual instruction needs attention by the operator.

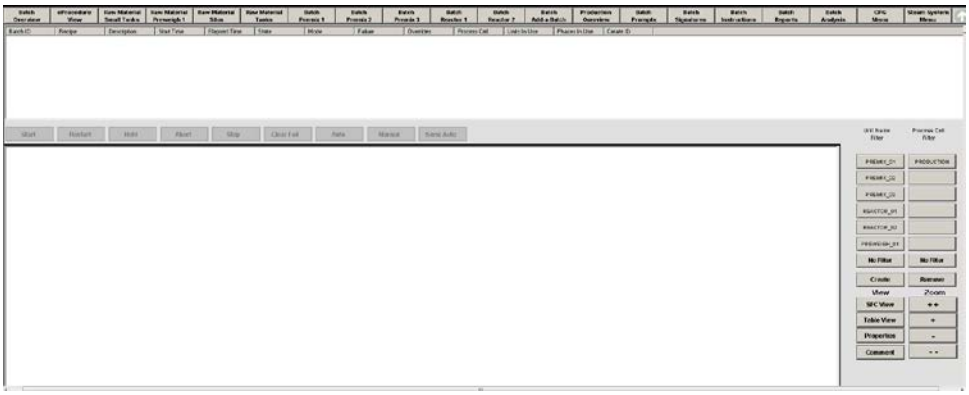
19. If you get a script error, select ***Yes*** to close it.

NOTE: the orange background ? mark appears when there is an active prompt awaiting the operator's attention.

Lab 1: Factory Talk Batch "Basics"

21. From the Batch System navigation menu bar, select the **Batch Overview** button.

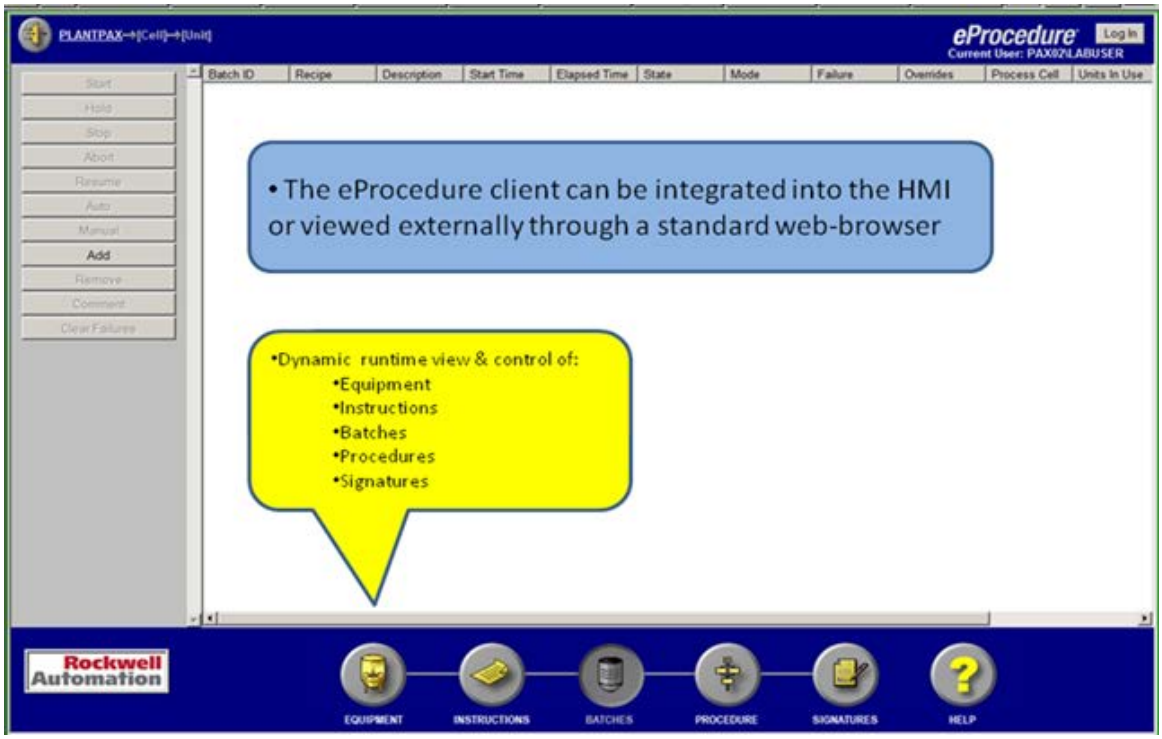
22. The following Batch Status Overview graphic will open. This standard PlantPAx screen offers integrated FactoryTalk Batch visualization components. There are buttons that provide comprehensive options for S88 batch interactions by the operators. The top portion of the screen will display control recipes in a top-down list. The lower portion of the screen will provide a SFC view of a recipe. The lower portion can also display a tabular view of a recipe for those that prefer a table format.



23. From the ***Batch System*** navigation menu bar, select the ***eProcedure View*** button,

Lab 1: Factory Talk Batch "Basics"

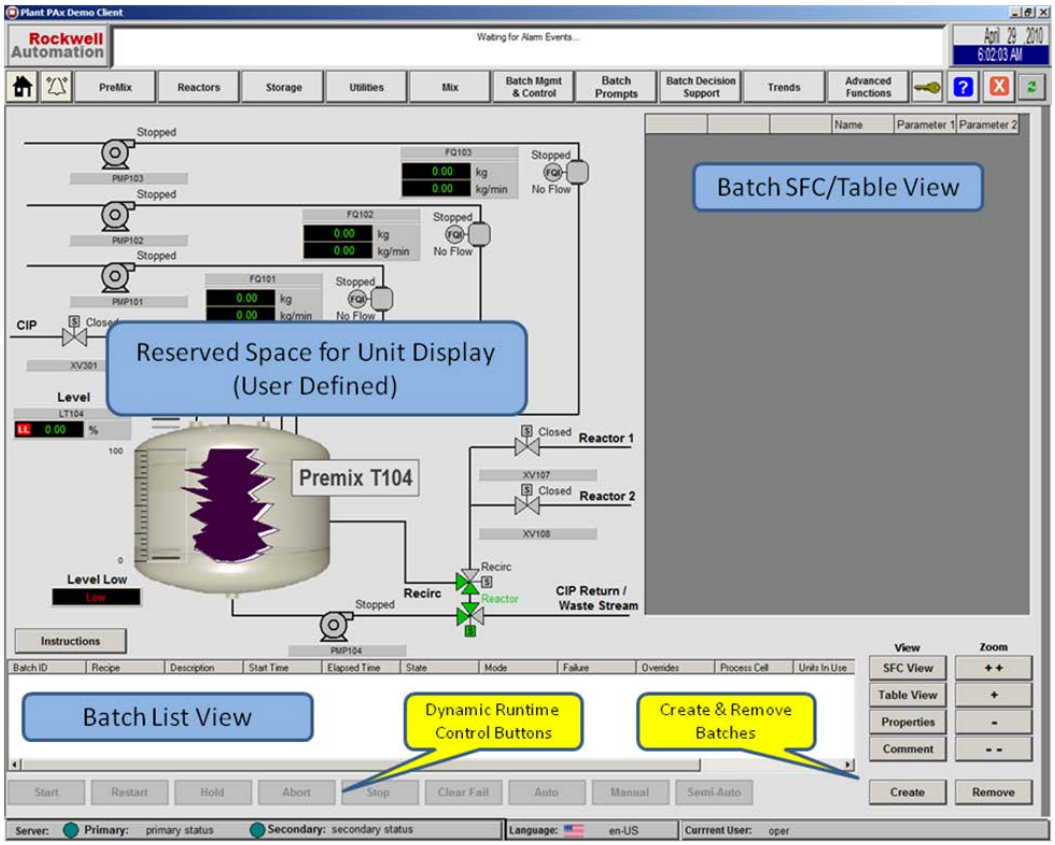
24. The Batch eProcedure display will open. This is an HMI interface that the operators can use for dynamic manual batch instructions. SOPs can be transformed into S88 compliant recipes, batch operations can be made more consistent, clipboards and paper can become electronic records with security and signature timestamps. Integrated troubleshooting instructions, quick access to material safety datasheets, and other information can be integrated with the batch to give operators quick and relevant access to information they need.



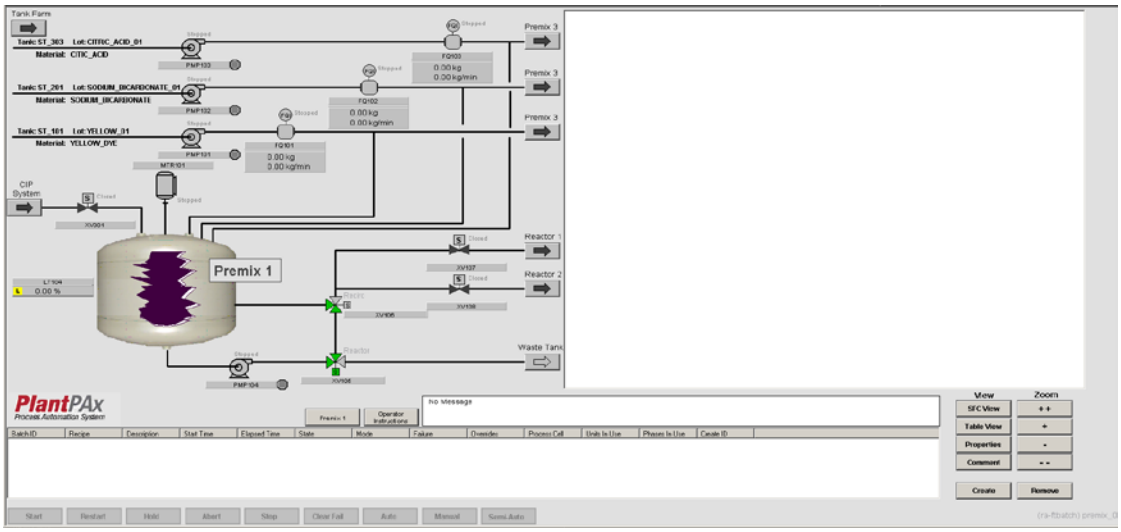
Lab 1: Factory Talk Batch "Basics"

25. From the Batch System navigational menu bar, select the ***Batch Premix 1*** button

26. The Batch Premix 1 display will open. This standard template for the "Batch Unit Display" has pre-defined section for the process Unit Display, the Batch List View, the Batch SFC/Table View, the Dynamic Runtime Control buttons, the Create and Remove Batch buttons, and the Operator Instructions.



Lab 1: Factory Talk Batch "Basics"



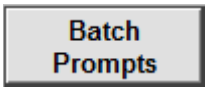
27. You will discover a similar display format for each of the other unit displays: Batch Premix 3, Reactor 1, and Reactor 2. Using the PlantPAx "Batch Unit" display template will help you build all your own specific Batch Unit displays quickly.

28. Go to the Batch System navigational menu bar, select the ***Batch Add-a-Batch*** button,

29. The "Add Batch" popup will open. From this graphic the user can select some the more common batches with the option to automatically start the batch, and remove it when complete. This screen is configured during the engineering stage of a project to point to specific units and recipes. Generally, this screen should only be used for small systems or systems where a fixed number of recipes exist. Different types of unit binding might be added, but is not shown here for this lab's common recipes.

Lab 1: Factory Talk Batch "Basics"

30. From the Batch System navigational menu bar, select the ***Batch Prompts*** button



31. The Batch Prompts popup window will open. This is the "Prompts List" screen. These prompts will be generated by the batch as it runs. These prompts are programmed into the equipment phase and recipe to prompt the operator at the required time for a response. That response could be a simple acknowledgement – OK to continue. It could be many other things as well - a prompt for recipe data such as, amounts to use in the batch, time to agitate, blending speed, preferred unit to use, etc. It will be different for every batch process to meet the specific needs for the operator to interact with the running batch.

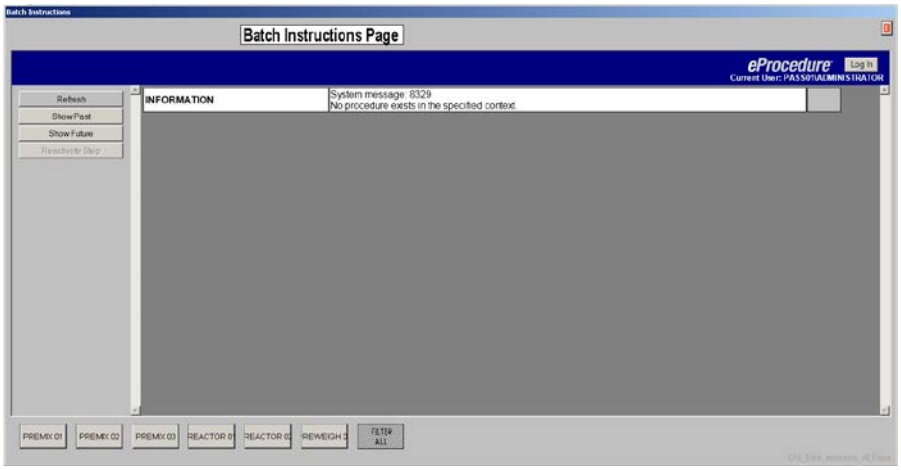
32. From the Batch System navigational menu bar, select the ***Batch Signatures*** button,

Lab 1: Factory Talk Batch "Basics"

33. The Batch Signatures popup window will open. This is the "Signatures List" screen. These signatures exist to allow users to define and enforce timestamps with user identity for configurable actions or events. This helps users apply multiple levels of security to various aspects of the batch process interactions, as well as batch data such as, parameters or reports.

34. From the Batch System navigational menu bar, select the ***Batch Instructions*** button,

35. The "Batch Instructions Page" popup window will open. This is the "Instructions List" display. Manual Batch instructions will appear in this window for recipes requiring manual batching. The instructions are presented in html form as coded for each particular manual equipment phase. This text instruction is customized by each user to present appropriate instructions at appropriate times. Specific batch data can be easily integrated into the instruction which is customized by each user. Pictures, hyperlink, and videos can be embedded into these instructions providing operators additional data along with their instructions. The buttons at the bottom filter the instructions by unit.



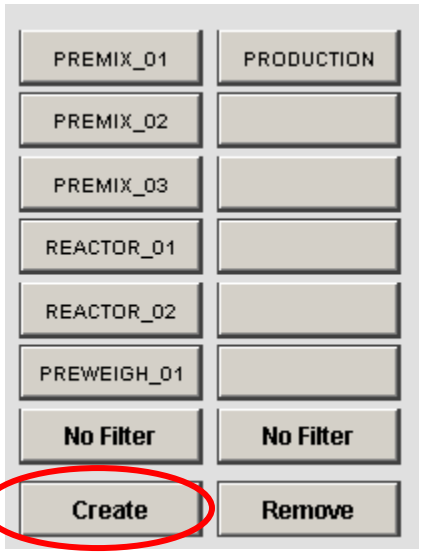
Lab 1: Factory Talk Batch "Basics"

View Recipe List & Create a Batch

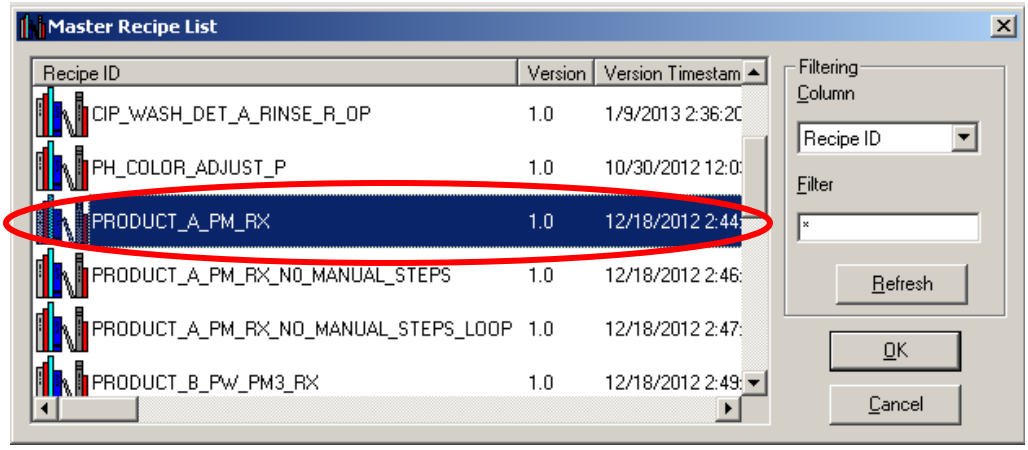
In this section you will start using the displays to create, command, and use batches.

1. From the Batch System navigational menu bar, select the **Batch Overview** button,

2. Select the ***Create*** command button within this display. This allows you to create a control recipe (i.e. batch) from the list of master recipes that have been released to production and provided that your security authentication allows you such permissions.

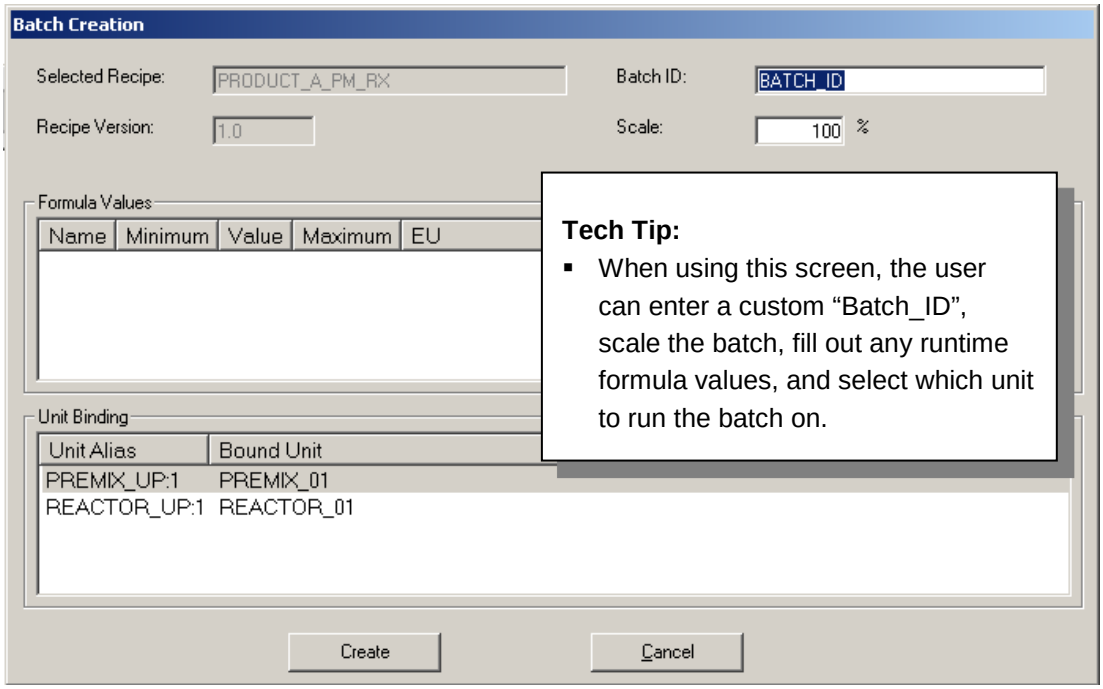


3. The create batch popup will open. Select ***"PRODUCT_A_PM_RX"*** from the list, and select the ***OK*** button



Lab 1: Factory Talk Batch "Basics"

4. The Batch Creation popup window will open.



5. In the ***Batch ID*** entry box, replace the default text with ***"PRODUCT_A.01".***

> **NOTE:** This Batch ID will be referenced in a later section of this lab.

6. Confirm that the ***Scale*** entry box is **100**. This specifies that the new control recipe will be a full-size batch. Adjusting this scale will proportionally adjust all formula values that are allowed to scale like material amounts.

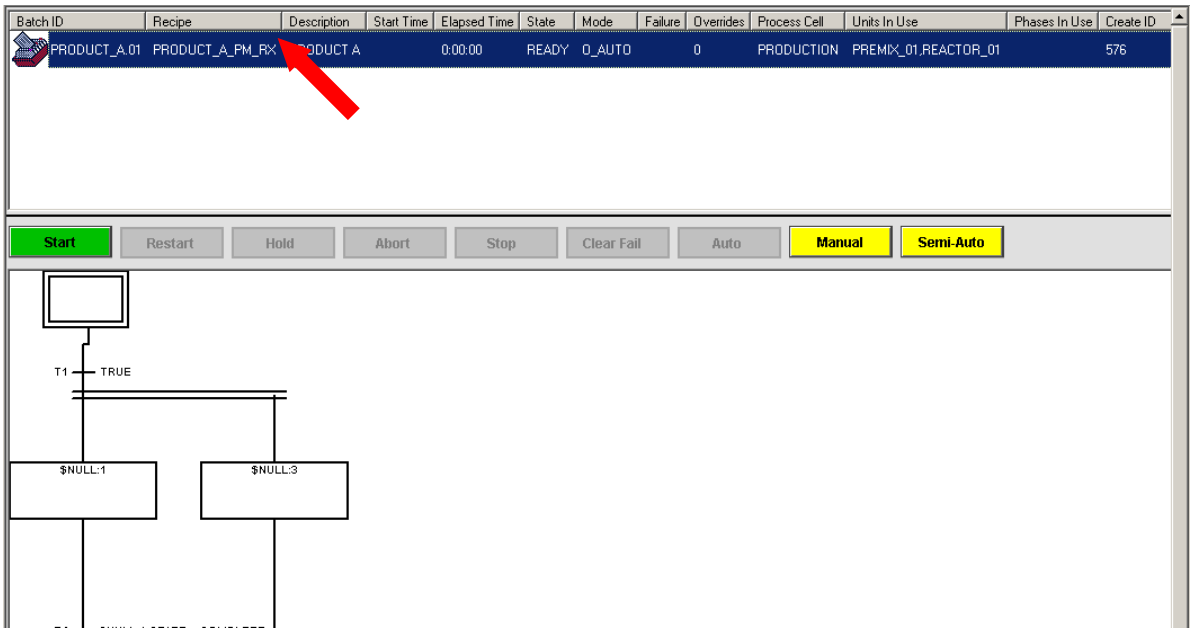
7. From the ***Unit Binding*** dropdown, select the ***PREMIX_01, and REACTOR_01*** units.

8. Select the ***Create*** button

> **NOTE:** Alternatively, the user can add a batch through the pre-configured "Add-a-Batch" graphic. It is important to note that the "Add Batch" screen limits unit and recipe selection to a finite number of pre-defined instances as configured by your engineer. The example shown above is the most flexible option. All new recipes show up in this list without additional engineering effort.

Lab 1: Factory Talk Batch "Basics"

9. The newly created control recipe will appear on the batch overview graphic within the batch view list. Select this newly created recipe with your mouse cursor. The procedure view, or SFC view below will display the recipe steps (i.e. unit procedures, operations) as a sequential function chart, or SFC. This can be altered to show a table view as well, but we don't recommend that for this lab.



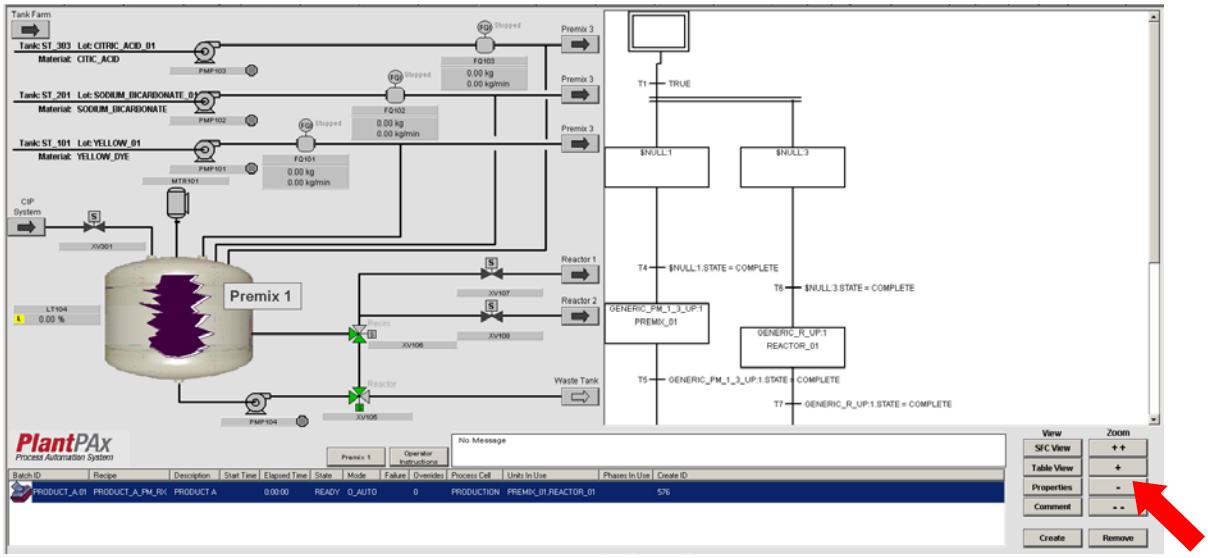
NOTE: This graphic has been configured for default un-filtered view of the batch system. Dynamic filter buttons have been configured in the upper right side of the screen. Also notice this screen defaults to show the SFC view in the bottom of the screen. The filters and default view are basic design configurations of the graphic. During runtime, the operator can change the filter and view through the buttons on the right side of the screen. It will only show if operations within the unit procedure for that control recipe is actual active for the recipe. Filters can be dangerous if you forget to disable them. Use the **No Filter** button to disable any filters.

NOTE: Take a moment to look at the data in the batch list table. Each line item shows key data for the batch. Also note that the recipe utilizes batch comments. These comments offer additional information for the runtime user. In the bottom window, the screen is set to default to SFC view. You can change this to table view by selecting the "table view" button on the right hand side. Give it a try!

Lab 1: Factory Talk Batch "Basics"

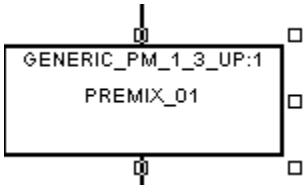
10. Now let's look at the Premix_01 unit display. From the Batch System navigational menu ***Batch Premix 1*** button,

11. The Batch Premix 1 display will open, select the batch. If the SFC view is too small, you can adjust the size of the display by selecting the Zoom +, or Zoom – buttons. Give them a try.

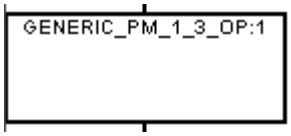


NOTE: This graphic has been configured with a static filter to only show Premix_01 unit batches.

12. The SFC display is showing the highest level of the recipe, the Procedure level that contains unit procedures. We want to go to the Operation level of the recipe. Double-click on the PREMIX_01 Unit Procedure step in the SFC View.

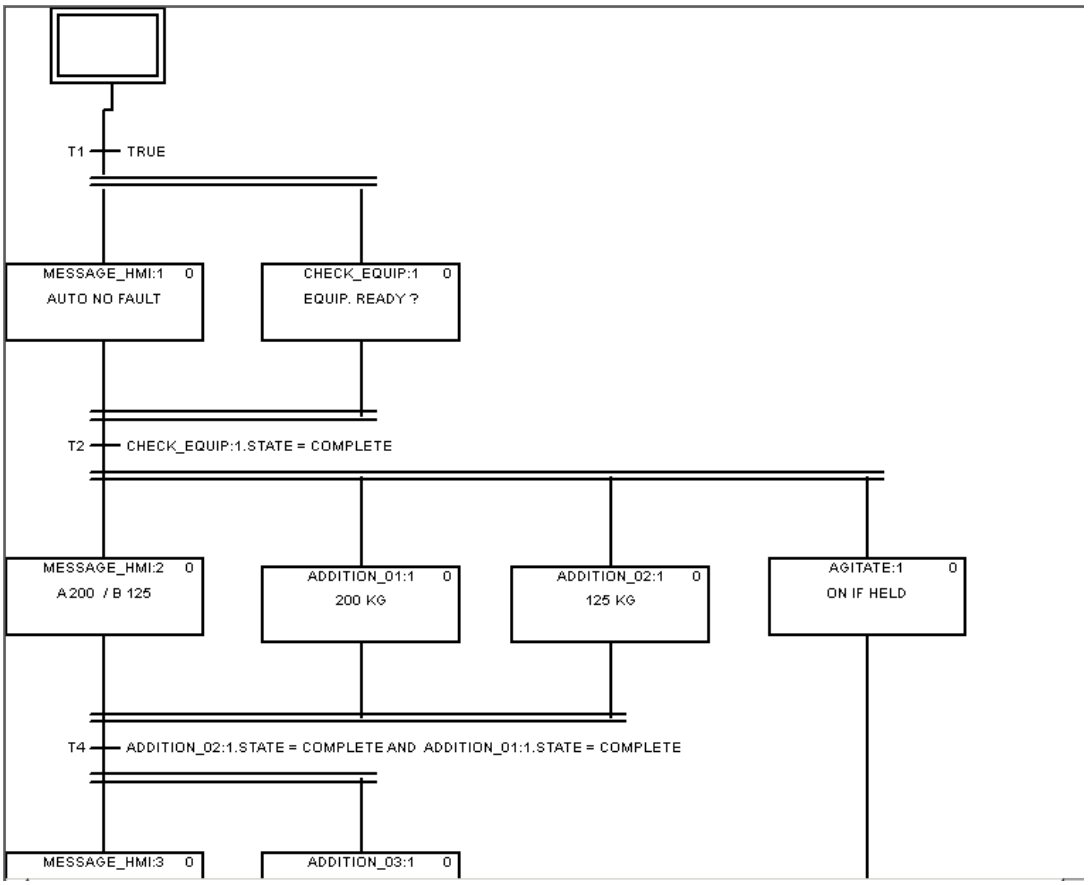


Lab 1: Factory Talk Batch "Basics"

13. The Operation step, 

for the unit procedure in Premix 01 should appear within the SFC view. Double click on it to get to the Phase level of the recipe.

14. Your SFC View should look something like this,



15. Before we start this control recipe, let's look at a few more features of the integrated graphic for Premix 1. You should have already tried the Zoom buttons, now let's try the Table View button.

Lab 1: Factory Talk Batch "Basics"

16. From the ***Batch Table View***, Select the ***ADDITION_01:1*** phase line 5.

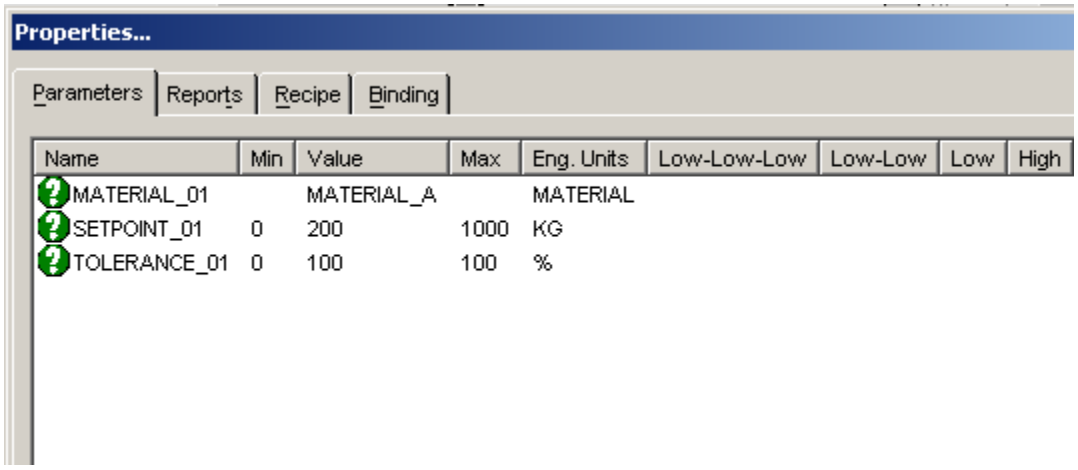
			Name	Parameter 1	Parameter 2	Parameter 3	Para
1			MESSAGE_HMI:1	AUTO NO FAULT	**********	**** BATC	***
2			CHECK_EQUIP:1	EQUIP. READY ?	STRING	??? RETRY	
3	?		MESSAGE_HMI:2	A 200 / B 125	**********	**** BATC	***
4	?		AGITATE:1	ON IF HELD		??? RETRY	AGI
5	?		ADDITION_01:1	MATERIAL_A MATERIAL	200 KG	100 %	
6	?		ADDITION_02:1	MATERIAL_B MATERIAL	125 KG	100 %	
7	?		MESSAGE_HMI:3	C 25	**********	**** BATC	***
8	?		ADDITION_03:1	MATERIAL_C MATERIAL	25 KG	100 %	
9	?		MESSAGE_HMI:4	MATERIAL_E	**********	**** BATC	***
10	?		MANUAL_ADD:1	MATERIAL_F MATERIAL	35 KG	35 KG	
11	?		RECIRC:1				
12			MESSAGE_HMI:5	30 SECOND MIX	**********	**** BATC	***
13			AGITATE:2	ON IF HELD		??? RETRY	AGI
14			MATERIA_E_MIX_TIMER:1	COUNT_DOWN $TIMER_TYPE	CONTINUE $HOLD_BEHAVIOR	30 SECONE	
15	?		MESSAGE_HMI:6	MANUAL PH	**********	**** BATC	***
16	?		SAMPLE_PH:1	7.5 PH			
17			MESSAGE_HMI:7	TRASFER READY	**********	**** BATC	***
18			X_OUT:1	FULL_TRANSFER X_OUT.CONTROL_STRATEGY	??? RETRY	FULL TRAN	???

17. Below the Table View display, the ***Properties***

button, or select the Batch Table View ActiveX and right-mouse click for Properties menu.

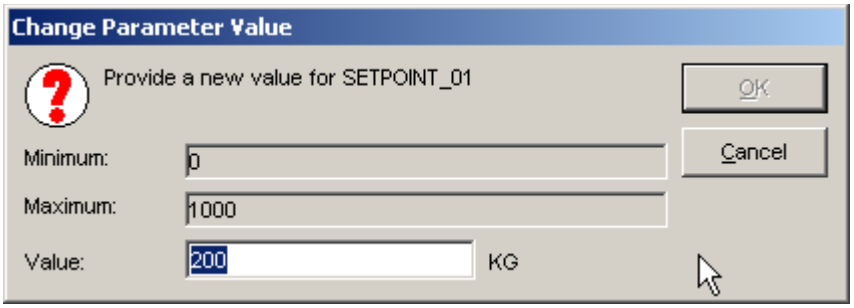
Lab 1: Factory Talk Batch "Basics"

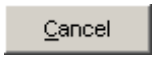
18. The ***Properties*** popup will appear. The default ***Parameters*** tab has focus.



NOTE: The Parameters tab shows all configured formula values for the phase.

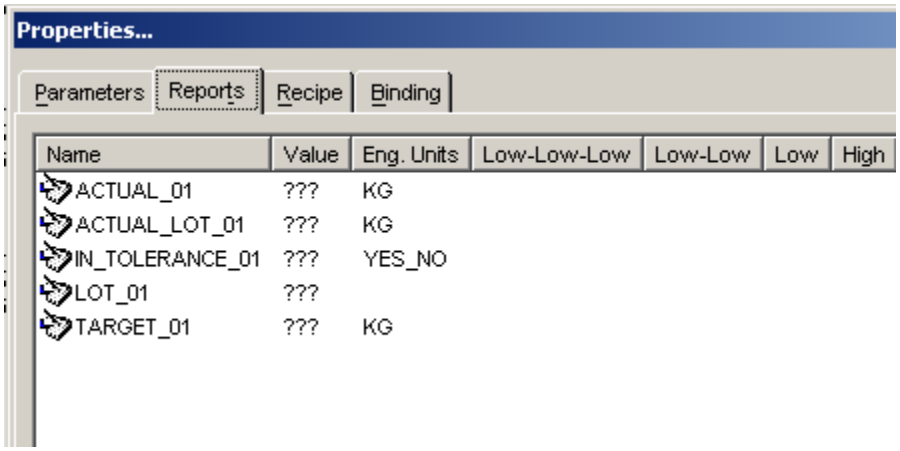
19. Double-click the ***Setpoint_01*** line. The ***Change Parameter Value*** popup will appear. This gives a user, with appropriate security access, the ability to change recipe values.



20. Select the ***Cancel***  button.

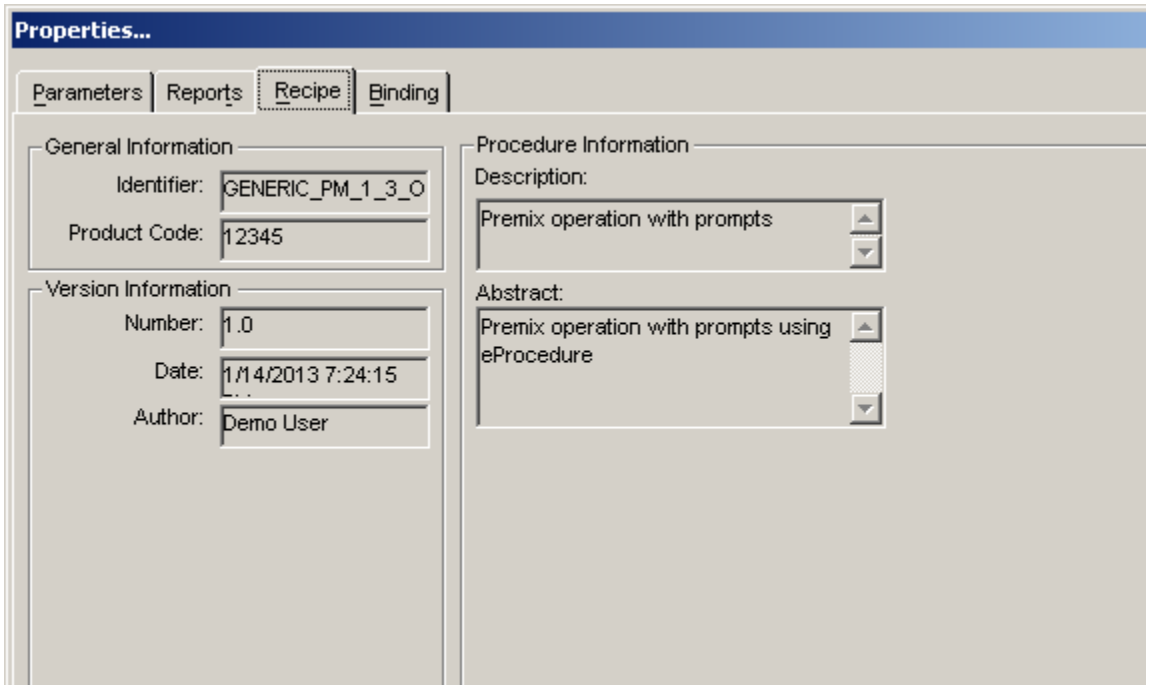
Lab 1: Factory Talk Batch "Basics"

21. From the ***Properties*** popup, select the ***Reports*** tab.



NOTE: The Reports tab will show the values for this step once he phase is run, and the report values are reported to the batch journal, typically, this occurs when the phase completes. Reports can be sent at any time by the phase logic to the journal, but most do so at the end of their running logic, or automatically in Terminal state.

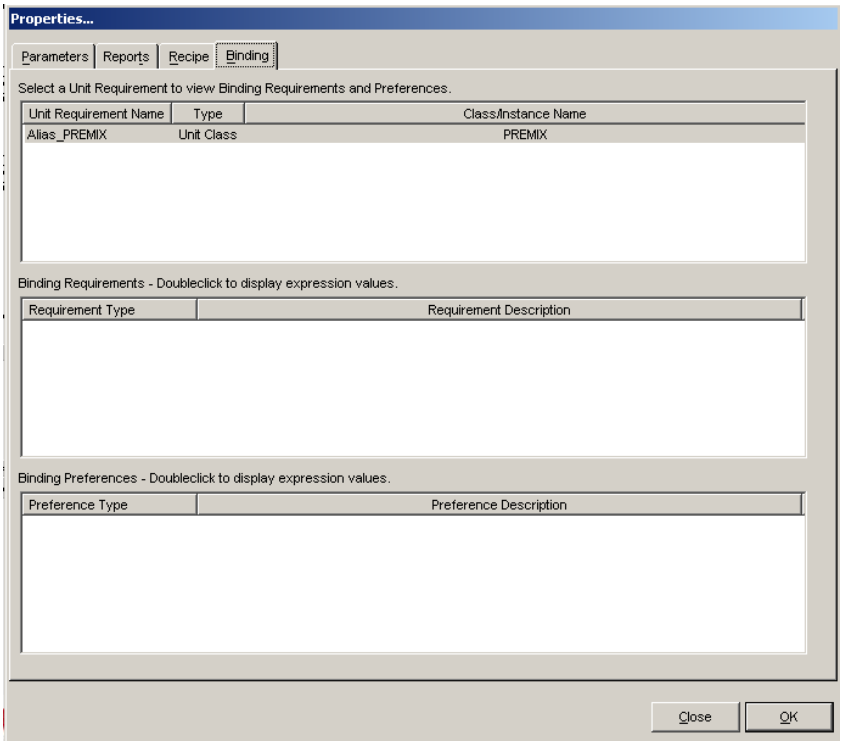
22. From the ***Properties*** popup, select the ***Recipe*** tab.



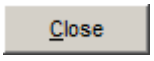
Lab 1: Factory Talk Batch "Basics"

NOTE: The Recipe tab will show the header data for the recipe, including: Name identifier, code, version information, descriptions, & abstracts.

23. From the ***Properties*** popup, select the ***Binding*** tab.



NOTE: The Binding tab shows all unit requirements including binding requirements and preferences.

24. Select the ***Close***  button.

Lab 1: Factory Talk Batch "Basics"

Run & Interact with the Batch

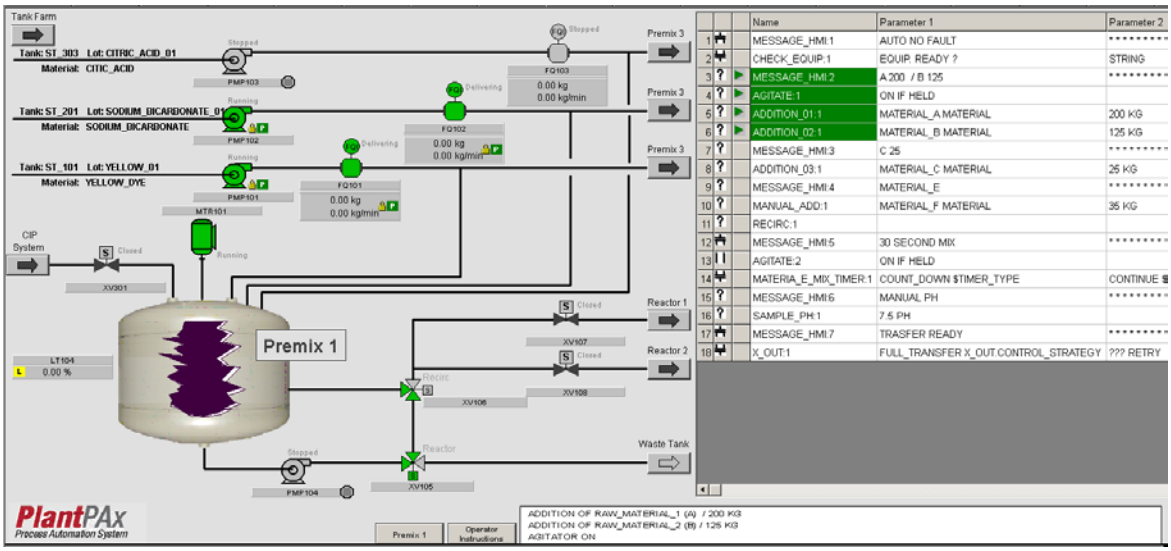
Start Batch

1. From the Premix 1 screen, select the ***Start***

button.

2. The batch will begin. Active steps are highlighted in green and the dynamic control buttons are changed to allow valid commands during execution.

NOTE: The first activity for this batch will be adding two ingredients to the tank while agitating. You can view the material and amount setpoint information in the list table view. You can view the dynamic runtime values in the totalizer blocks on the screen.



NOTE: If you prefer, try the alternative SFC view by selecting the ***SFC*** button on the bottom right of the screen. Also note in the lower right hand corner a text box that shows the messages of the Message phases, informing what the recipe step is doing.

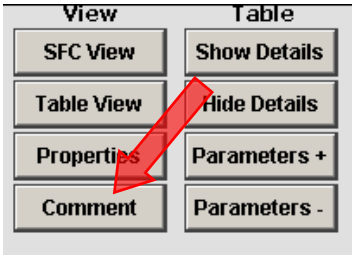
Lab 1: Factory Talk Batch "Basics"

3. The batch continues by adding the third material, Material C, also while agitating. When the automatic ingredient additions are complete, the batch proceeds.

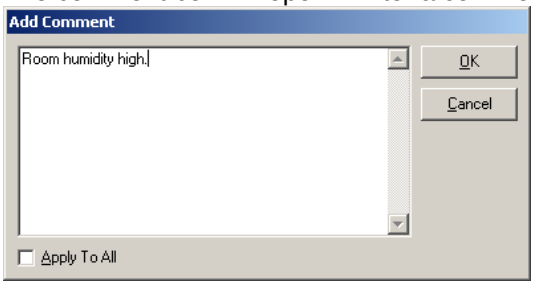
	Name	Parameter 1	Parameter 2
1	MESSAGE_HMI:1	AUTO NO FAULT	**********
2	CHECK_EQUIP:1	EQUIP. READY ?	STRING
3	MESSAGE_HMI:2	A 200 / B 125	**********
4	AGITATE:1	ON IF HELD	
5	ADDITION_01:1	MATERIAL_A MATERIAL	200 KG
6	ADDITION_02:1	MATERIAL_B MATERIAL	125 KG
7	MESSAGE_HMI:3	C 25	**********
8	ADDITION_03:1	MATERIAL_C MATERIAL	25 KG
9	MESSAGE_HMI:4	MATERIAL_E	**********
10	MANUAL_ADD:1	MATERIAL_F MATERIAL	35 KG
11	RECIRC:1		
12	MESSAGE_HMI:5	30 SECOND MIX	**********
13	AGITATE:2	ON IF HELD	
14	MATERIA_E_MIX_TIMER:1	COUNT_DOWN $TIMER_TYPE	CONTINUE $HOLD_BEHAVIOR
15	MESSAGE_HMI:6	MANUAL PH	**********
16	SAMPLE_PH:1	7.5 PH	
17	MESSAGE_HMI:7	TRASFER READY	**********
18	X_OUT:1	FULL_TRANSFER X_OUT.CONTROL_STRATEGY	??? RETRY

4. Now we will add a comment into the batch journal. Select the ***Comment***

button.



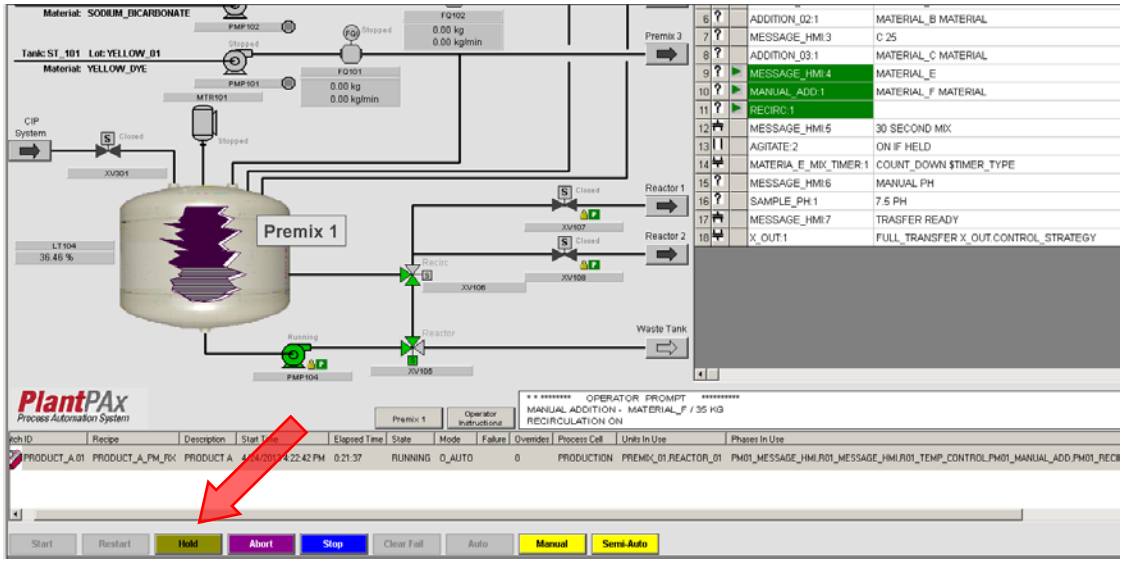
5. The comment box will open. Enter a comment for the batch journal and select ***OK***



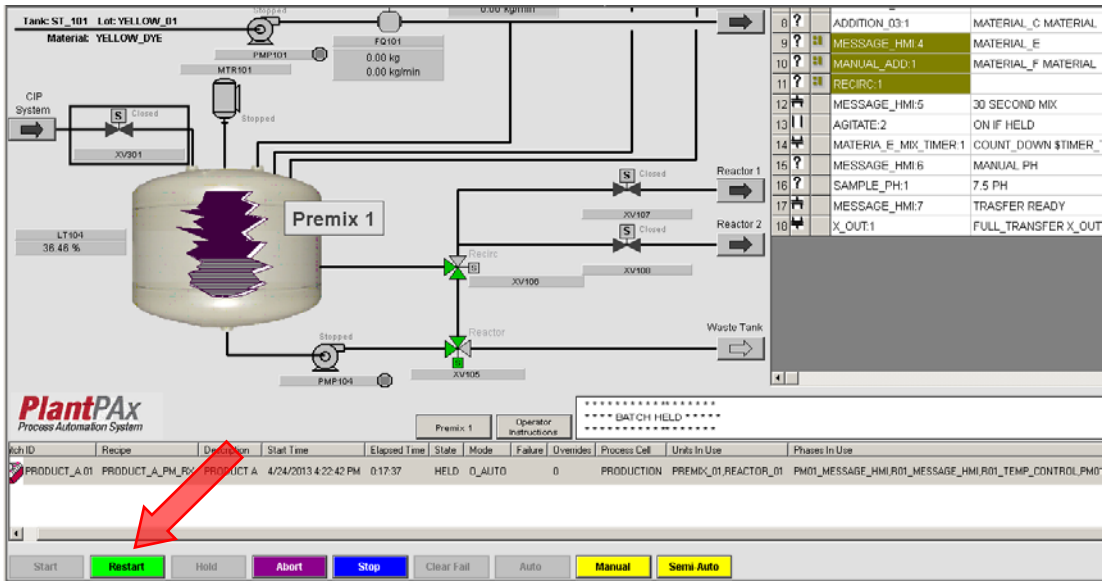
NOTE: Batch comments get entered into the master electronic batch journal. This allows a user to enter batch activity commentary.

Lab 1: Factory Talk Batch "Basics"

6. The batch continues to the manual additions and recirculation step. Select the ***Hold command*** to see both, the state transition, and command options change.



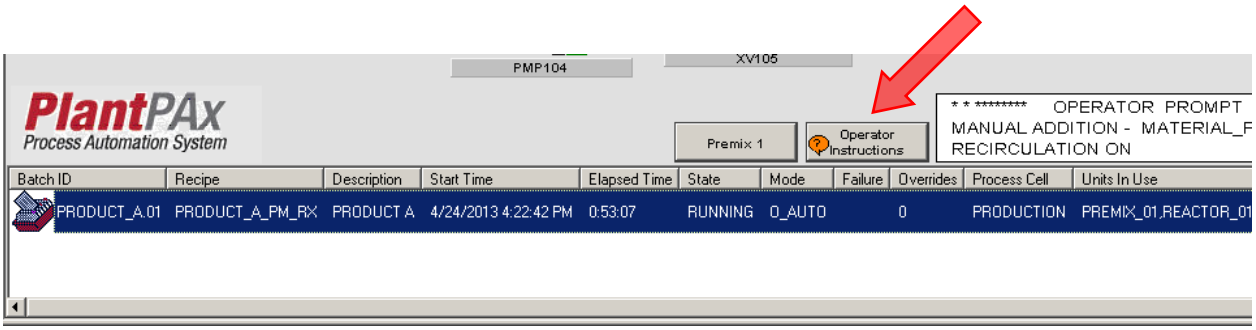
7. The phases will go Held, and the Restart command button will become active. Select ***Restart command***



NOTE: In this stage of the recipe, we introduce manual operations via eProcedure.

Lab 1: Factory Talk Batch "Basics"

Once the batch is Running and the Premix is recirculating you can call up the manual instructions through the button directly above the batch list towards the middle section called ***Operator Instructions***,



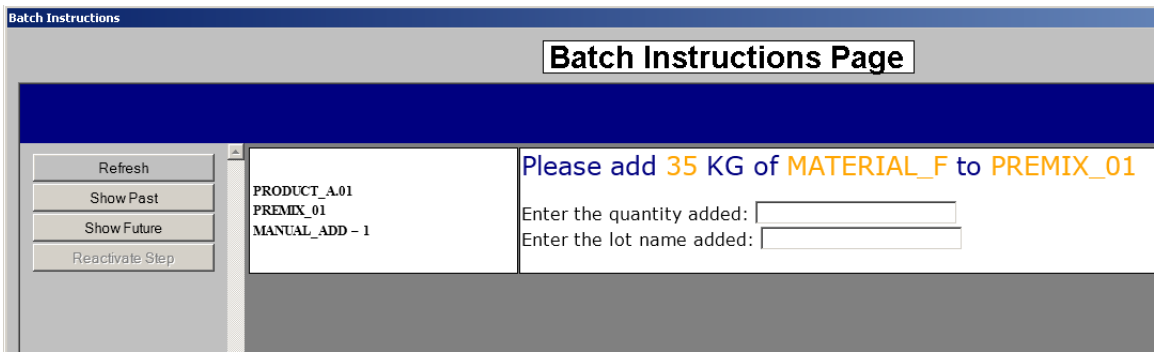
Or you may select the ***Batch Instructions***

button from the Batch System navigational menu bar.

NOTE: the orange background ? mark appears when there is an active prompt awaiting the operator's attention.

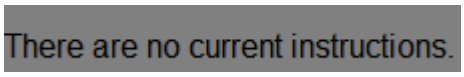
8. The "Batch Instructions Page" popup will appear. This popup contains all active instructions for the system. Please enter ***35.2*** for the "Quantity" and "***ABCD"*** for the "Lot Name" Box, and select the ***OK***

button.



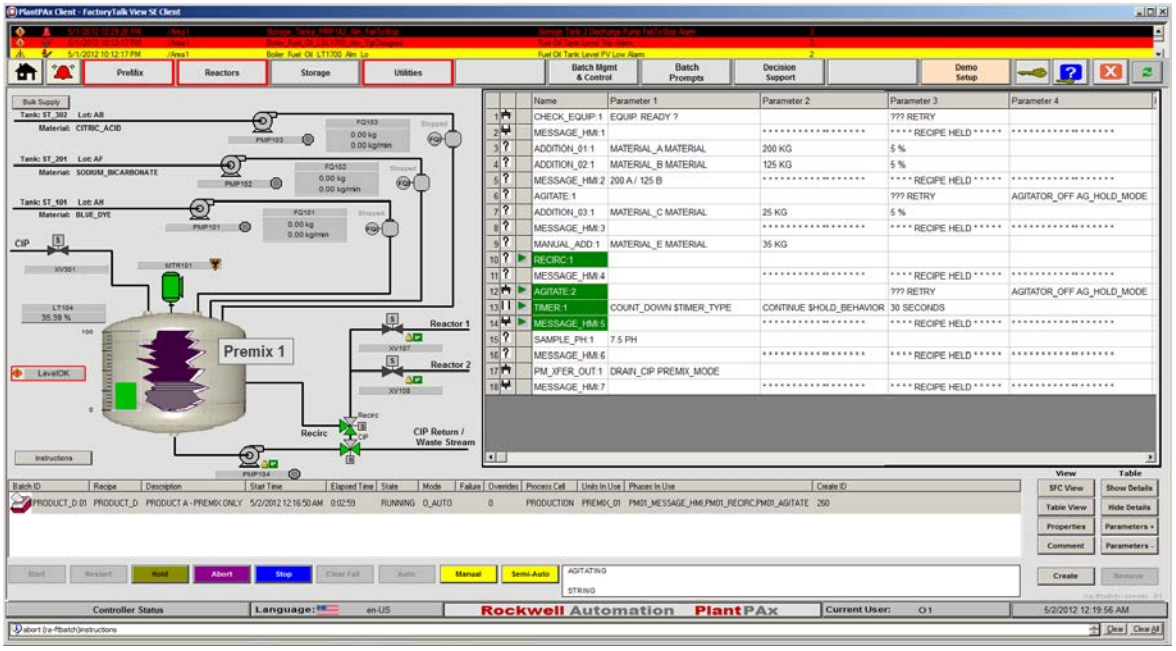
NOTE: When this popup is accessed from the unit display, it will be filtered for that unit. When accessed from the menu button bar, it will be unfiltered. The user can filter the display at any time through the buttons on the bottom of the screen.

Lab 1: Factory Talk Batch "Basics"

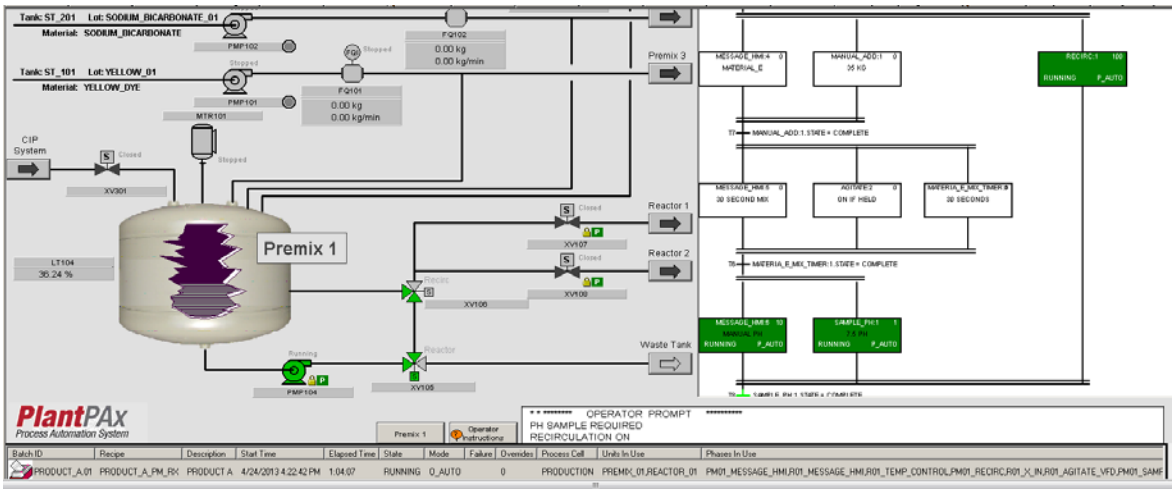
9. Wait to confirm that the instruction shows complete 

10. Select the ***Close*** button.

11. The next stage of the batch will continue to recirculate as well as start agitation for 30 seconds.

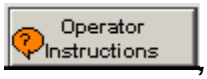


12. Next, the batch advances to the "Sample PH" step.



Lab 1: Factory Talk Batch "Basics"

NOTE: In this stage of the recipe, we will again use manual operations via eProcedure.

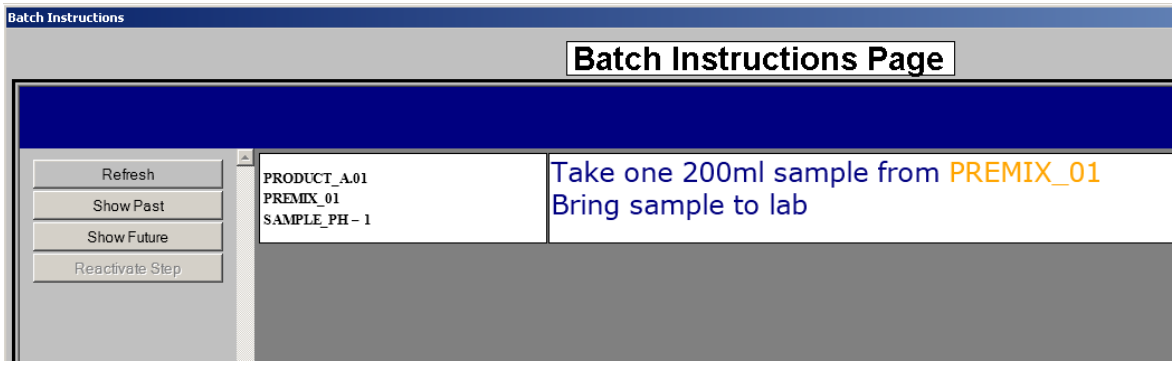
13. You can call up the manual instructions display through the button called, ***Operator Instructions*** 

, or you may select the ***Batch Instructions***

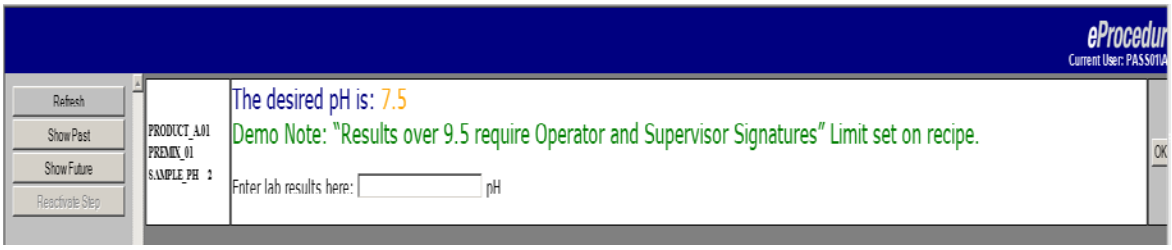
button from the Batch System navigational menu bar.

14. This is a two part prompt, so select the ***OK*** button

to the far right of the instructional message to acknowledge that a sample was taken.



15. The second step of this prompt will be to enter a pH reading.



NOTE: Electronic Signatures and *e*Procedure

Batch Electronic Signatures are electronically recorded representations of a signature and their associated data. Signature data includes timestamps, security permissions, meanings for Signoffs, and comments. When a Signature Request is created, an entry is recorded in the Event Journal. If the Signature Request is user generated, a Signature dialog box is displayed to the user. Additional journal entries are recorded when a Signature Request is completed, user cancelled, system cancelled or when a Signoff is successful or unsuccessful. *These electronic signatures include all the components necessary for compliance with 21 CFR Part 11*.

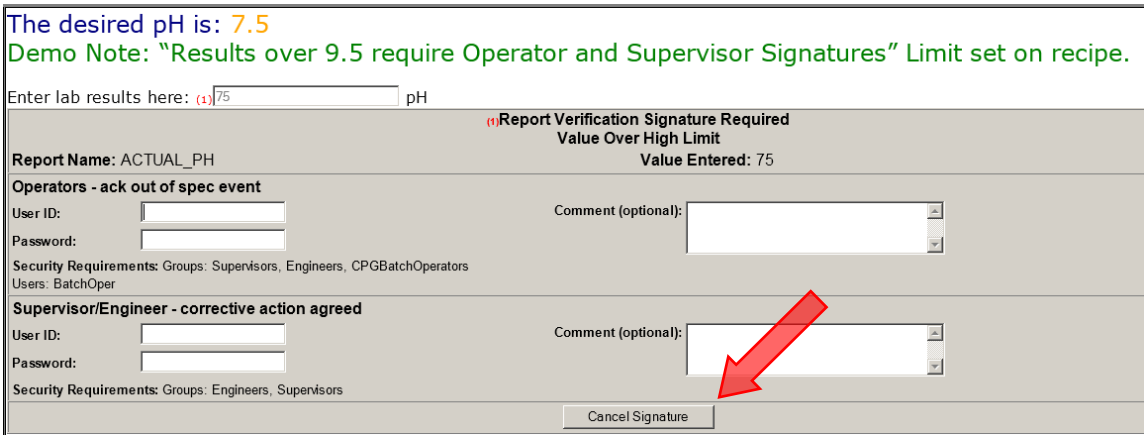
Lab 1: Factory Talk Batch "Basics"

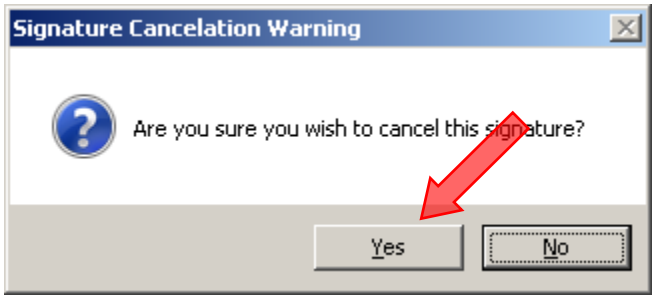
The requested user information in a Signature dialog box is defined by the Signature Template configured in the FactoryTalk Batch area model. Signature Templates determine the number of Signoffs required to complete a Signature Request. Each Signoff has associated security permissions and may require a comment. Signature Templates are used with Command Verification Policies, Parameter Deviation Verification Policies, General Usage Phase Logic Requests or eProcedure Step Verifications to generate Signature Requests displayed in the Batch View, ActiveX Controls and *e*Procedure.

16. Enter a pH of ***75*** and select ***OK***. This is an erroneous entry. The expected entry should have been 7.5 but we want to simulate an accidental entry without the decimal.

17. The signature page comes up for a sign off as 75 is outside the acceptable range. Select the ***Cancel Signature***.

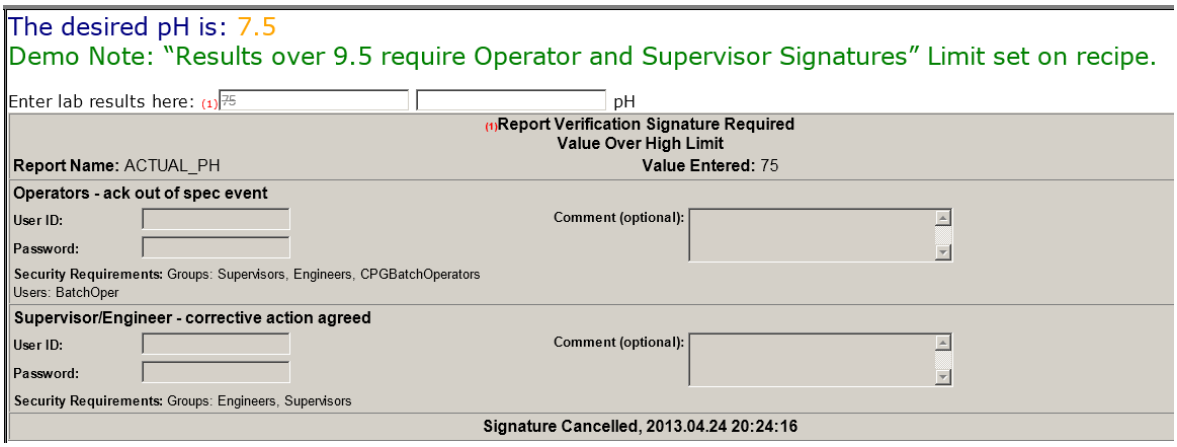
button at the bottom center of signature display, and select ***YES*** to the confirm prompt.



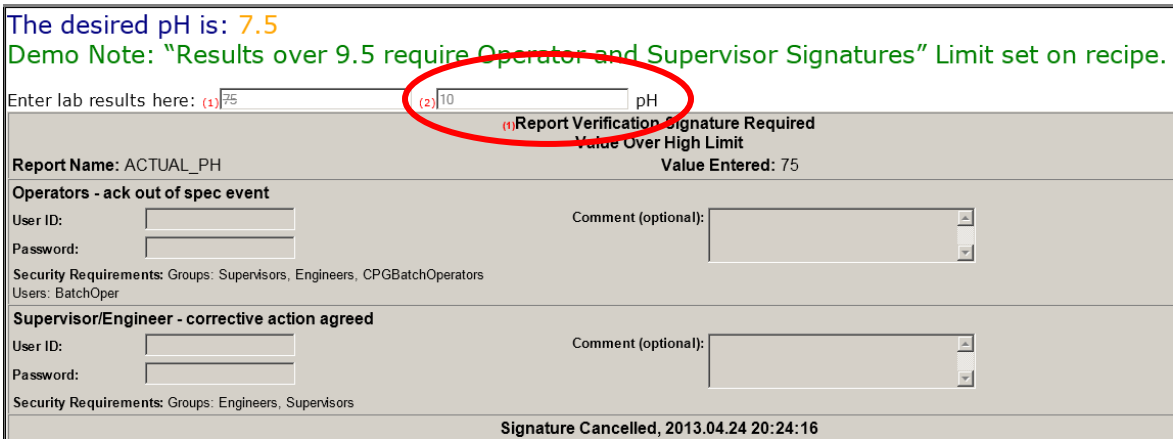


18. This will strike out the old value and allow the operator to enter a new value. All the data and events that happened are being recorded in the journal. This is the equivalent of striking out a value on paper and entering a new value.

Lab 1: Factory Talk Batch "Basics"

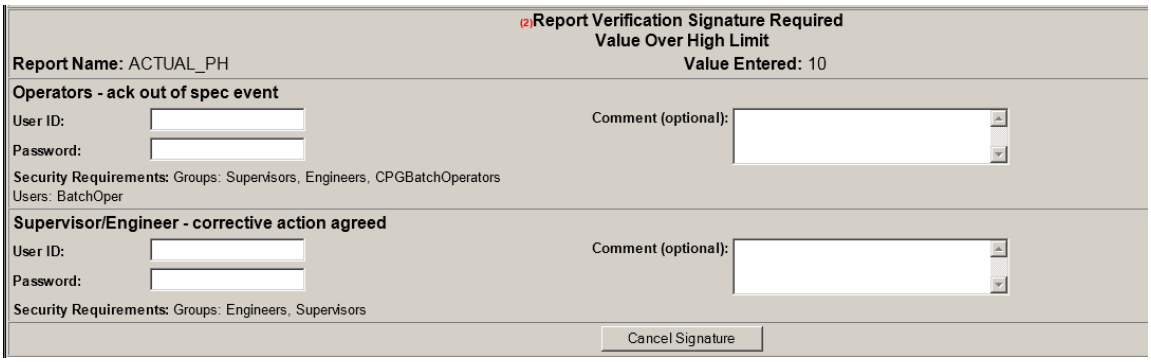


19. Now let's follow through with an out of range value. Modify the previous value 75 and enter a value of ***'10'*** in the pH field and select the ***OK*** button to the far right.

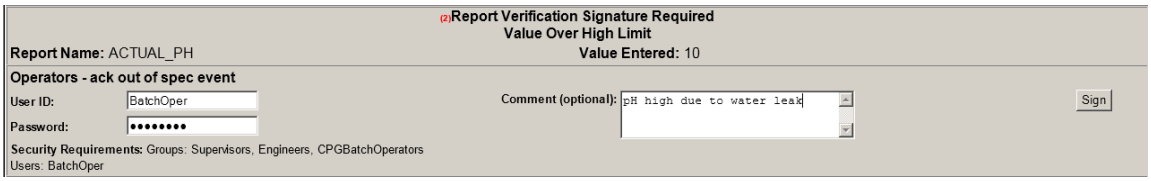


20. This causes another electronic signature since the pH value is still out of bounds to the high side. Scroll to the bottom of the prompt screen, enter an Operator User ID = "**BatchOper"** and Password = "***Operator"*** or User ID = 'O1" no password – a blank password.

Lab 1: Factory Talk Batch "Basics"



21. Enter an optional comment, and select the ***Sign*** Sign button.



NOTE: This signature template has been configured for double sign off with optional comments. The first signature must be from an "Operator"

22. Scroll to the bottom of the screen, enter a Supervisor/Engineer User ID = "**Supervisor"** and Password = "**Supervisor"** or User ID = 'S1' no password – blank password.

23. Enter an optional comment, and select the ***Sign*** Sign button.

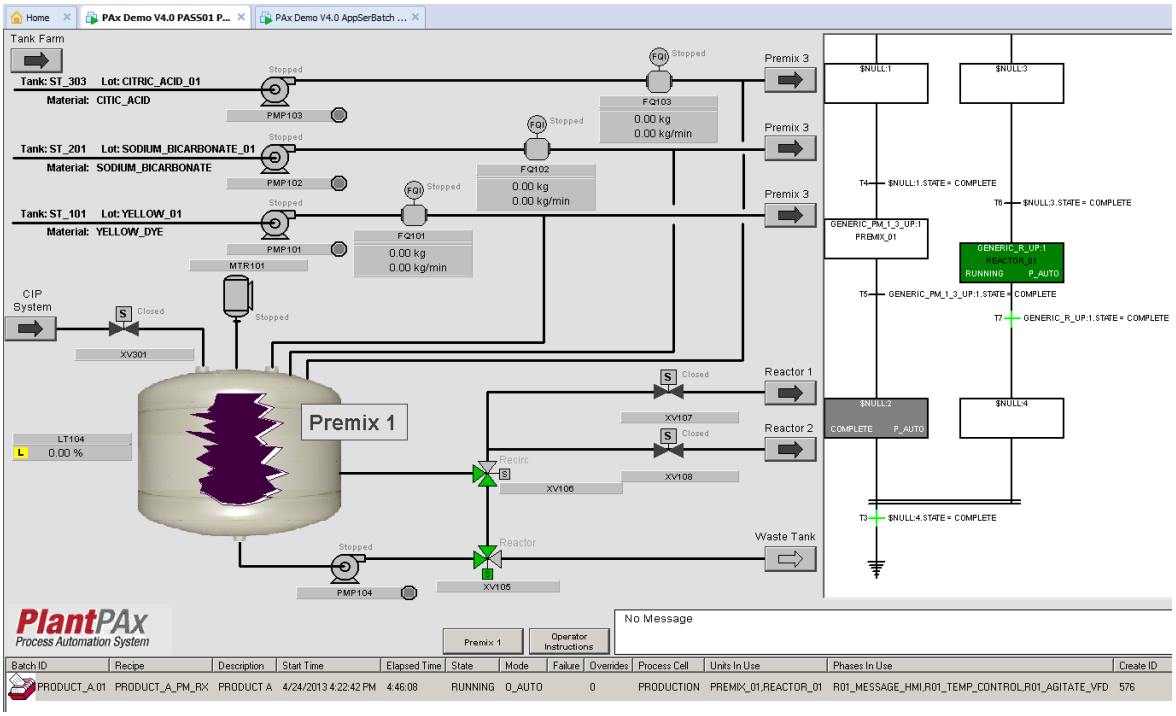
.

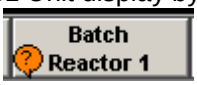
24. Wait to confirm that the instruction shows complete There are no current instructions.

25. Select the red X on the Instruction Page window at the far upper right to close the window.

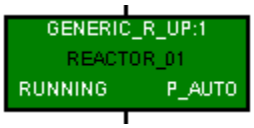
Lab 1: Factory Talk Batch "Basics"

26. The batch progresses to the final step which is to transfer the tank's contents and empty the tank. The Reactor 01 unit is now running and the Premix 01 unit procedure is complete.

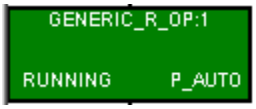


27. Switch to the Reactor_01 Unit display by selecting it from the Batch System navigational menu bar - ***Batch Reactor 1***, 

28. Our focus needs to change to the reactor unit since this contains the batch. Double click on the SFC step for the Reactor_01 unit procedure step to go to the S88 operation level.

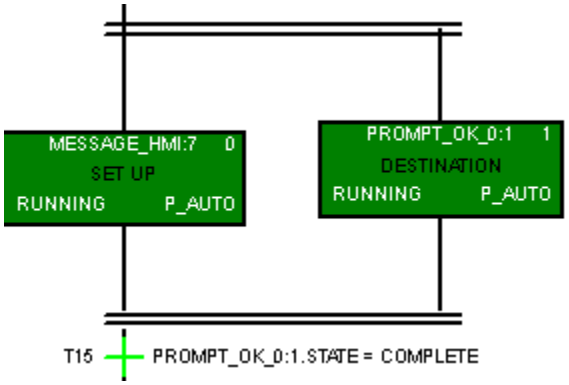


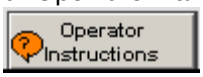
29. Double click on the SFC step for the Reactor_01 unit procedure step to go into the S88 operation level.



Lab 1: Factory Talk Batch "Basics"

30. Double click on the SFC step for the Reactor_01 operation step to go to the S88 phase level. Wait until the transitions to the PROMPT_OK step which requires another operator interaction to continue.



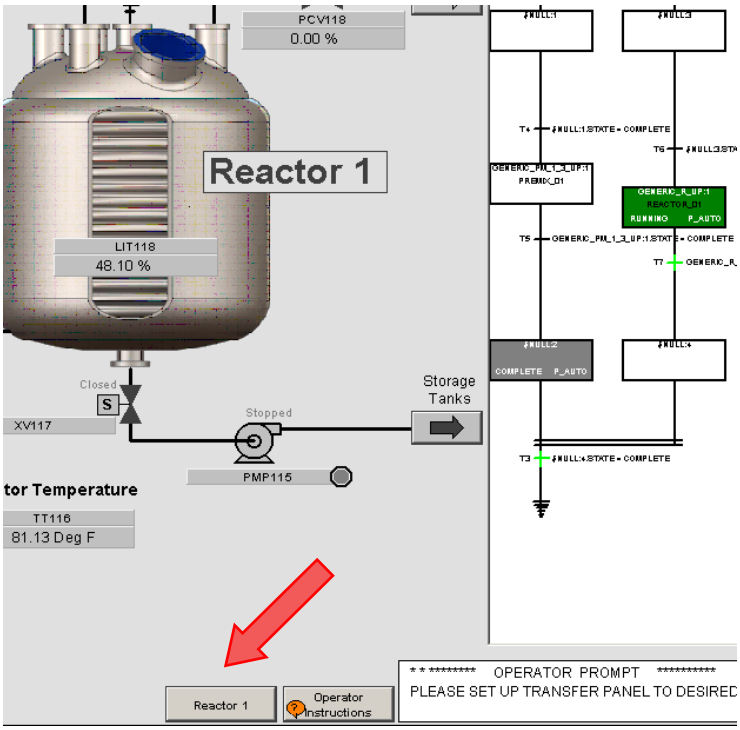
31. Notice when the Instruction prompt indicator tells you there is an unanswered instruction for the reactor 01 unit. Open the manual instructions display through the button called, ***Operator Instructions*** 

within the Unit display**,** or you may select the ***Batch Instructions***

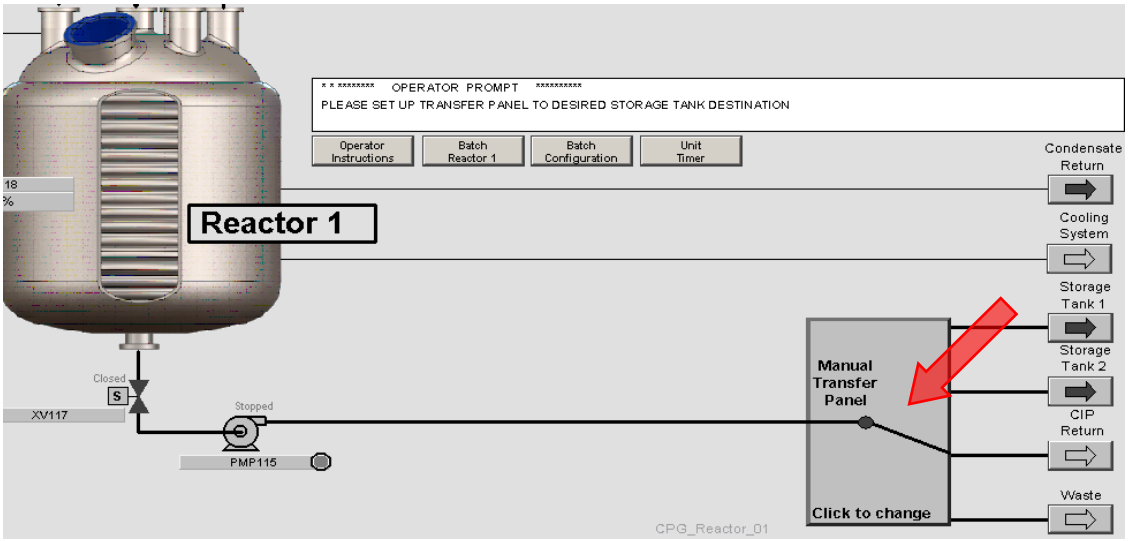
button from the Batch System navigational menu bar.

32. It is asking you to hook up the reactor discharge to a storage tank. In order to do this, you need to go to the reactor 01 display. ***Close*** the instruction window, on the unit reactor 01 display, select the Reactor 1 button

Lab 1: Factory Talk Batch "Basics"

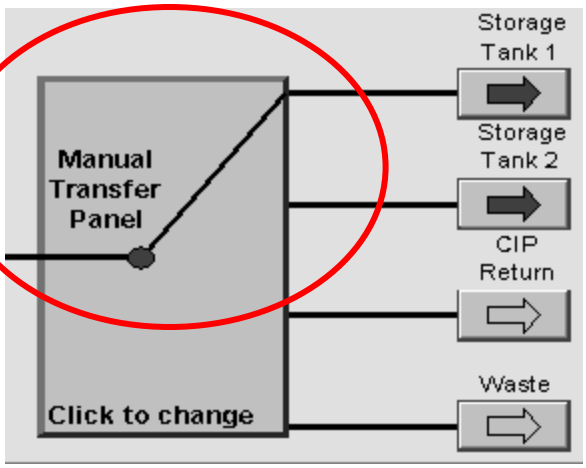


33. Once you do this as the operator, there is a manual transfer switch on the far right bottom of the display, you can set the transfer path here.



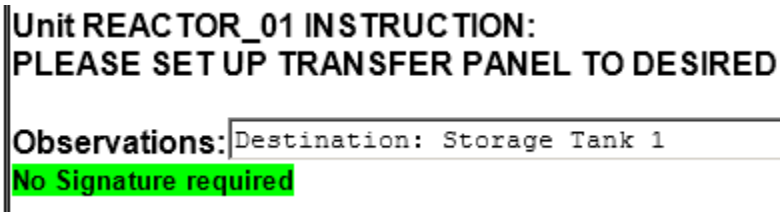
34. Please set the Manual Transfer Panel to ***Storage Tank 1*** by clicking the panel on the display.

Lab 1: Factory Talk Batch "Basics"

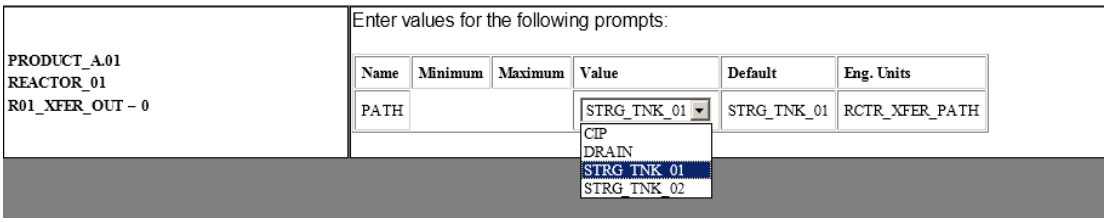


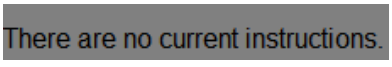
35. Once you have done this, go back to the instruction prompt. A quick way is to use the button in the Reactor 01 graphic, select ***Operator Instructions***

36. For the instruction prompt, enter your comments into the text as shown here:.



37. Select the OK button to progress the phase. The next instruction prompts you to input your transfer location chosen. Select ***STRG_TNK_01***, then select ***OK***

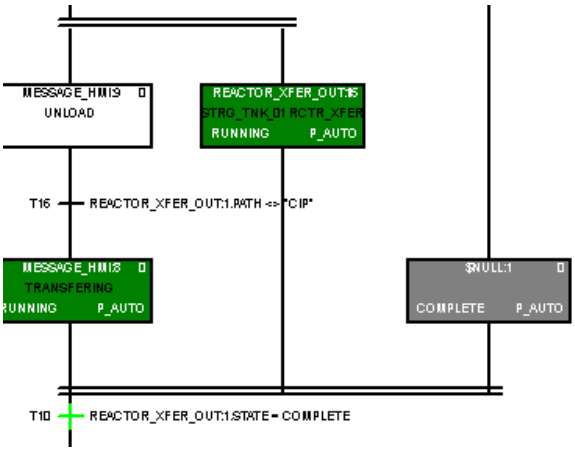


38. Wait to confirm that the instruction shows complete 

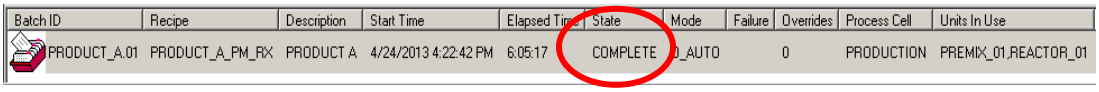
Lab 1: Factory Talk Batch "Basics"

39. Select the red X on the Instruction Page window at the far upper right to close the window.

40. Got to the Reactor 1 unit display to see the rest of the recipe execute. The Temperature control phase will complete as the material transfer comes to an end. In the SFC view you should see the final phase steps empty the reactor.

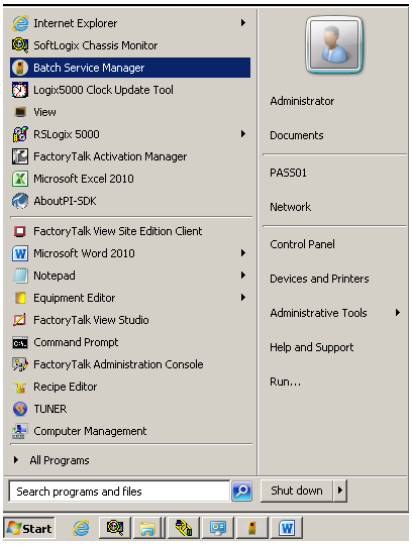


41. On the Control Recipe List, you will see the batch state go from Running to Complete,



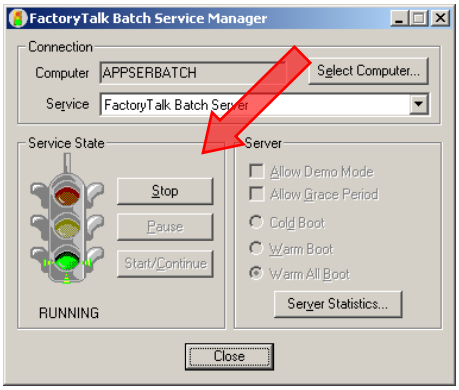
42. With the tank empty, the batch is now complete; please select the ***Remove*** button in the bottom right hand corner to take the batch off the list.

43. Congratulations, you are now a fully qualified operator!! We should shut the batch server down since we are done with production. From the Start menu, launch the Batch Service Manager,



Lab 1: Factory Talk Batch "Basics"

44. Issue a **Stop** command to the batch server,



The Operator's Perspective is now complete!

Lab 1: Factory Talk Batch "Basics"

Notes

Lab 1: Factory Talk Batch "Basics"

Engineer's Perspective

System modifications may be required over time; therefore, this user perspective will introduce you to several standard system engineering changes. These include: adding new system capabilities to the batch area model, enabling system optimization by defining new unit attributes, and synchronizing the batch area model with the Logix controller to pick up engineering changes.

In this lab you will be making equipment requirement changes, controller changes and recipe changes. To begin you will use the Batch Equipment Editor which is a graphical interface used to configure and maintain an equipment database, or a virtual representation of the ISA88 physical model for the facility. This equipment database, or what is often referred to as the Area Model, is saved as a customer relevant projectname.cfg file. For this lab we named it, PlantPAx_Demo.cfg.

This equipment database is accessed upon startup by the Equipment Editor as well as other Batch applications such as Recipe Editor, Batch Server service, and eProcedure Server. Any equipment changes often require a restart of these applications to enforce those changes.

Later you will use the Recipe Editor tool that allows you to create, edit, and maintain your master recipes. While the area model represents the equipment database, this database is the basis to provide a list of available units and phases for the recipe building tool. During recipe verification, the equipment database is used to ensure that the designated equipment is capable of executing the procedures. During recipe execution, resource arbitration functions use the equipment database to allocate equipment based on recipe and operator requests.

The importance of the area model cannot be overstated. It is the foundation for a properly designed ISA88 compliant batch system. Modular batch automation is a key benefit of having a properly defined area model. Other components are defined by the Equipment Editor inside the area model, such as arbitration resources, unit tags, parameter tags, report tags, and data server connections for interfaces to process-connected devices, or other control system objects (e.g. simulator, PC phases, etc.).

View & Edit Batch Area Model

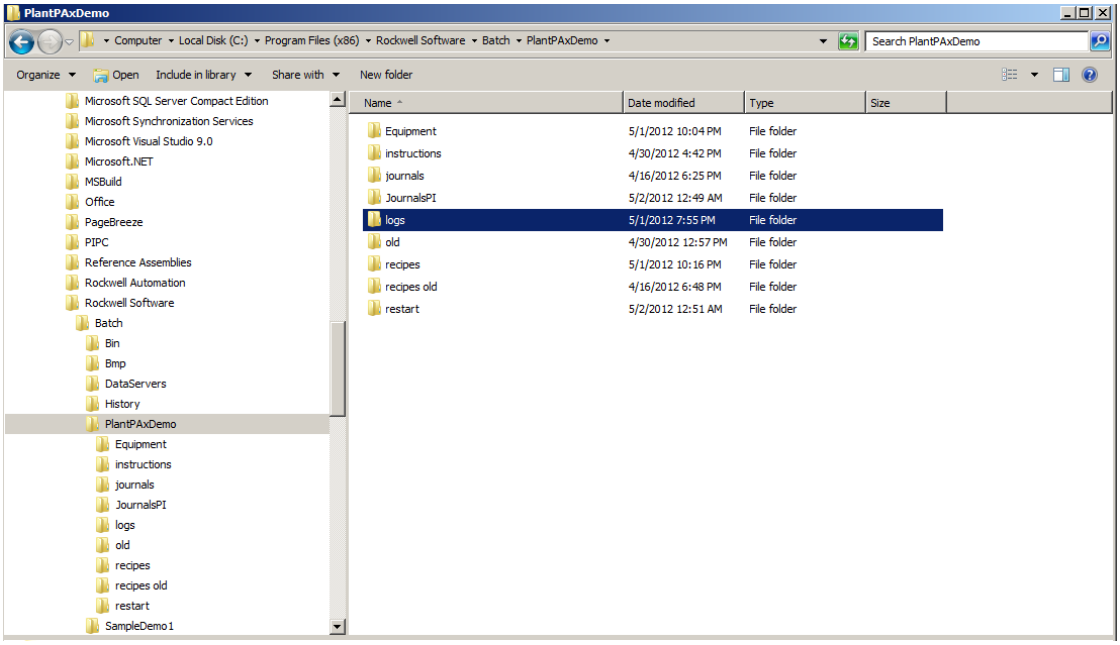
Every batch project should maintain the following folders (sub-directories) for batch-related files and data:

- Instructions (a repository for eProcedure instructions)
- Journals (a repository for batch records #.evt)
- Logs (a repository for the batchsvr.log file)
- Recipes (a repository for binary, or xml recipes)
- Restart (a repository for restart boot data)

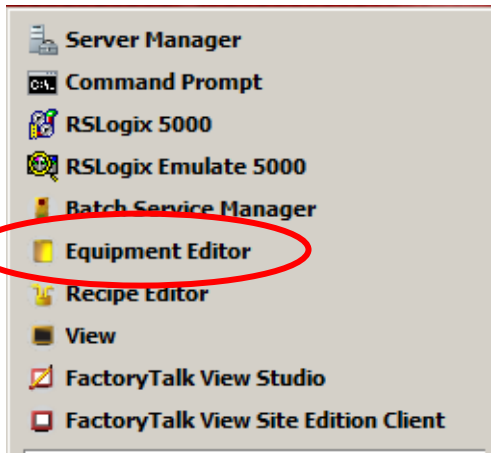
Lab 1: Factory Talk Batch "Basics"

For purposes of time in this lab exercise, your project folders have been created for you under "C:\Program Files (x86)\Rockwell Software\Batch\PlantPAxDemo". This is on the ***AppSerBatch*** image, and not the ***PASS01*** image. We will use the Equipment Editor on the PASS01 image.

1. Go to ***the AppSerBatch*** image. Open Windows Explorer and go the above to view the project folders.

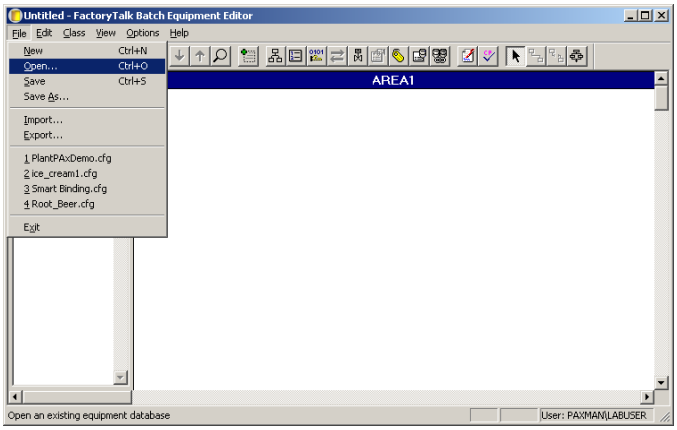


2. Return to the ***PASS01*** image. From the start bar, open the batch equipment editor, ***Start > Batch Equipment Editor***.

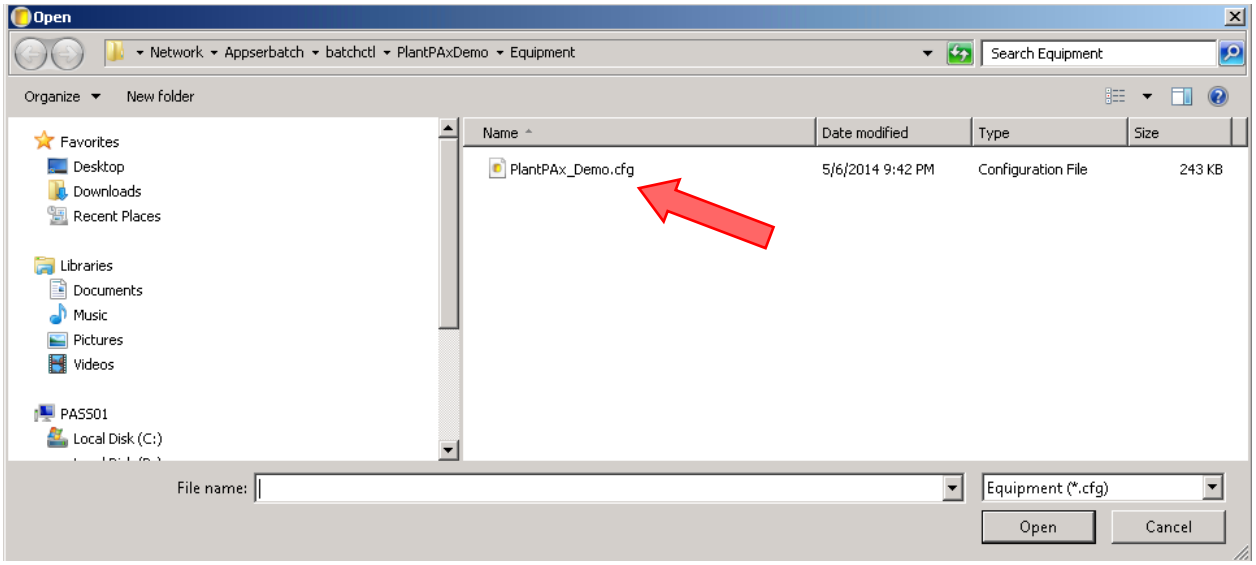


Lab 1: Factory Talk Batch "Basics"

3. The equipment editor will open. Select ***File → Open***

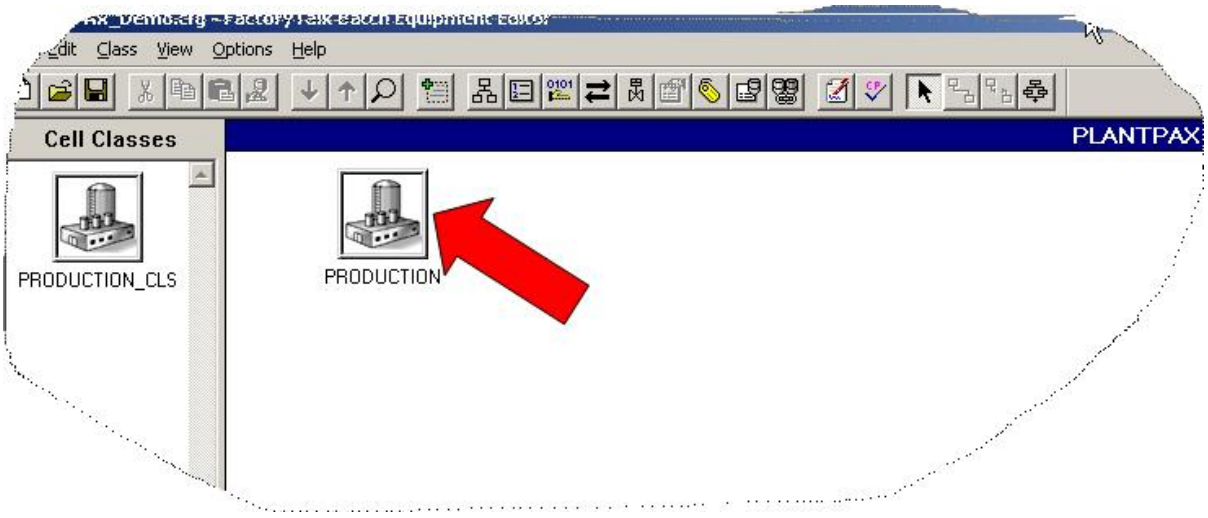


4. Select the ***PlantPAx_Demo.cfg*** and click the ***Open*** button



5. The "PlantPAx Demo" area model will open and display all defined process cells. Let's explore this area model where we have only one process cell named PRODUCTION,

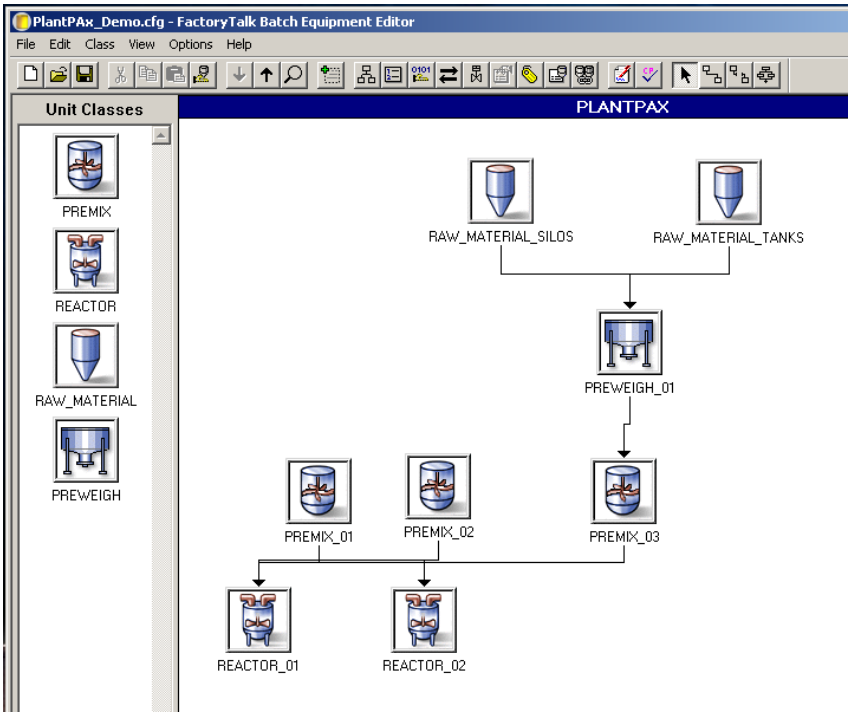
Lab 1: Factory Talk Batch "Basics"



6. Double-Click the ***PRODUCTION***

icon

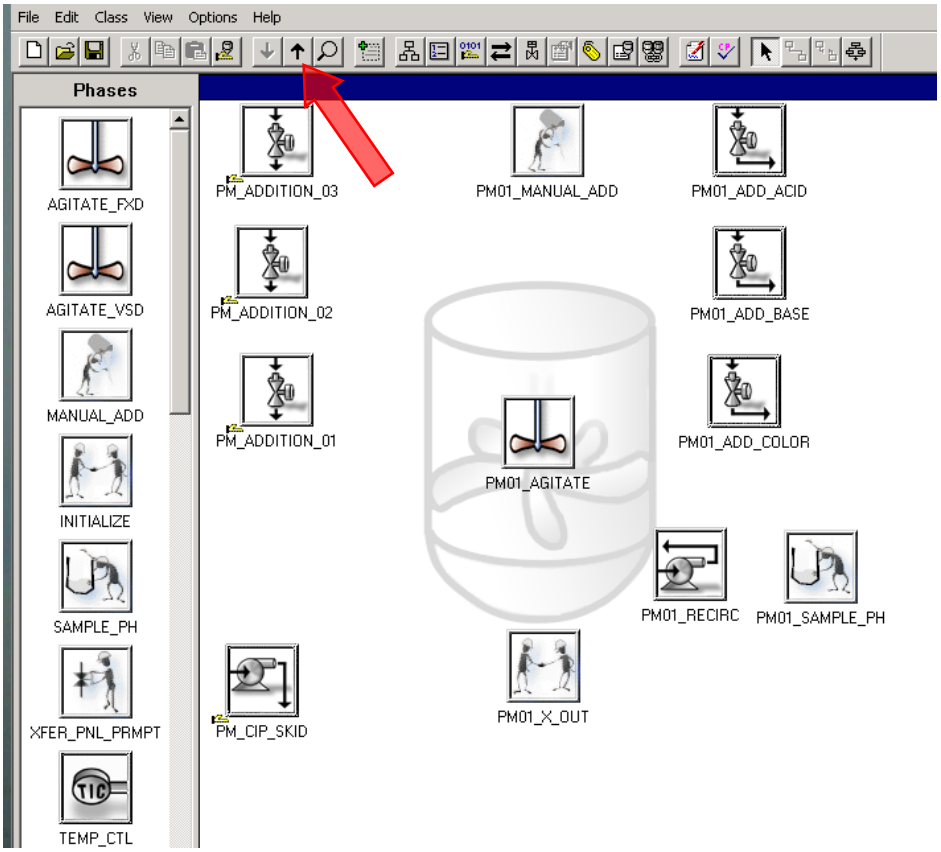
7. All units defined in the "Production" process cell are displayed such as PREMIX_01, REACTOR_02, etc.



Lab 1: Factory Talk Batch "Basics"

8. Double-Click the ***PREMIX_01***

unit icon



All phases defined in the "Premix_01" unit are displayed.

9. Select the ***Up*** arrow to navigate back to the unit listing

Browse a few more units within the area model by:

a. Double-Click the ***Reactor_01***

unit icon.

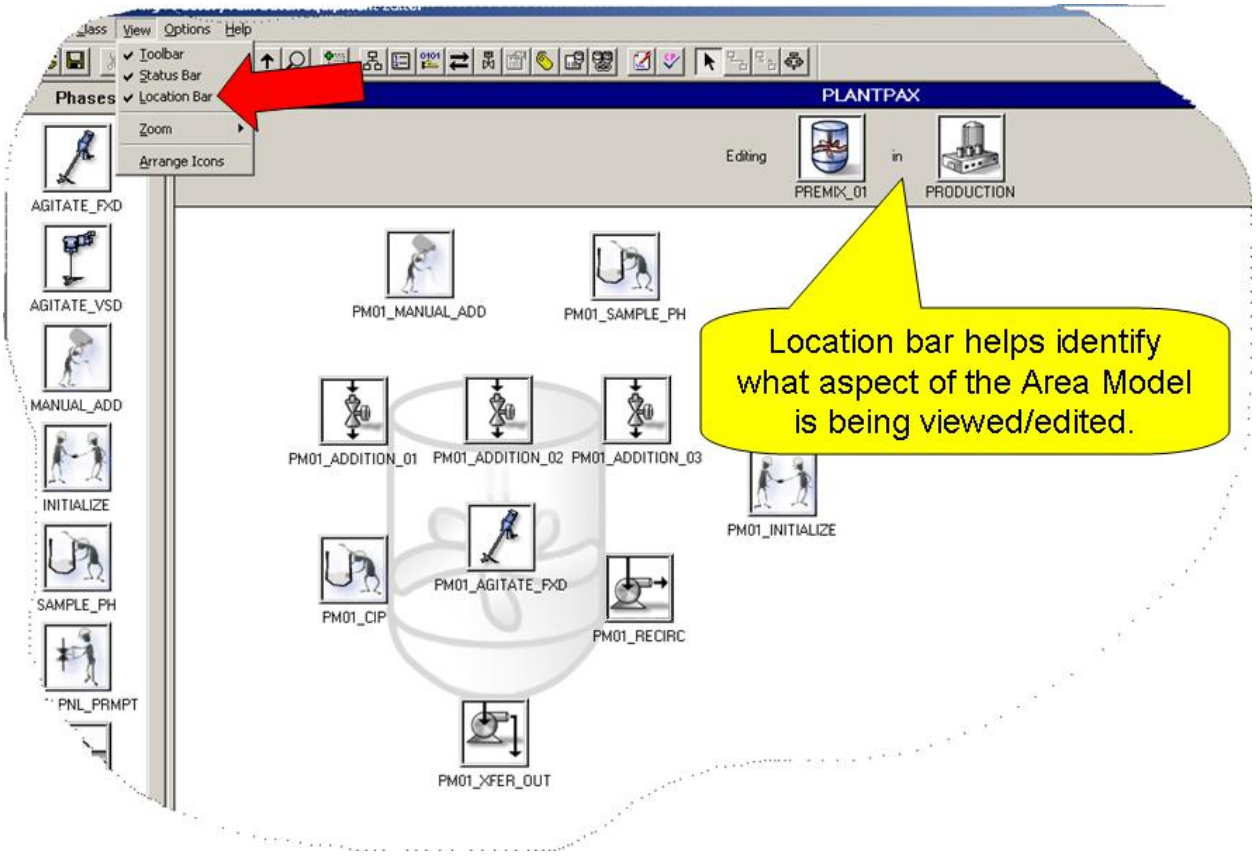
b. Double-Click the ***Reactor_02***

unit icon.

Lab 1: Factory Talk Batch "Basics"

NOTE: If dealing with many units within an area model, the Location Bar View may help you identify where you are working at all times. Use the View menu, and select Location Bar to toggle it on if off as seen in this example below:

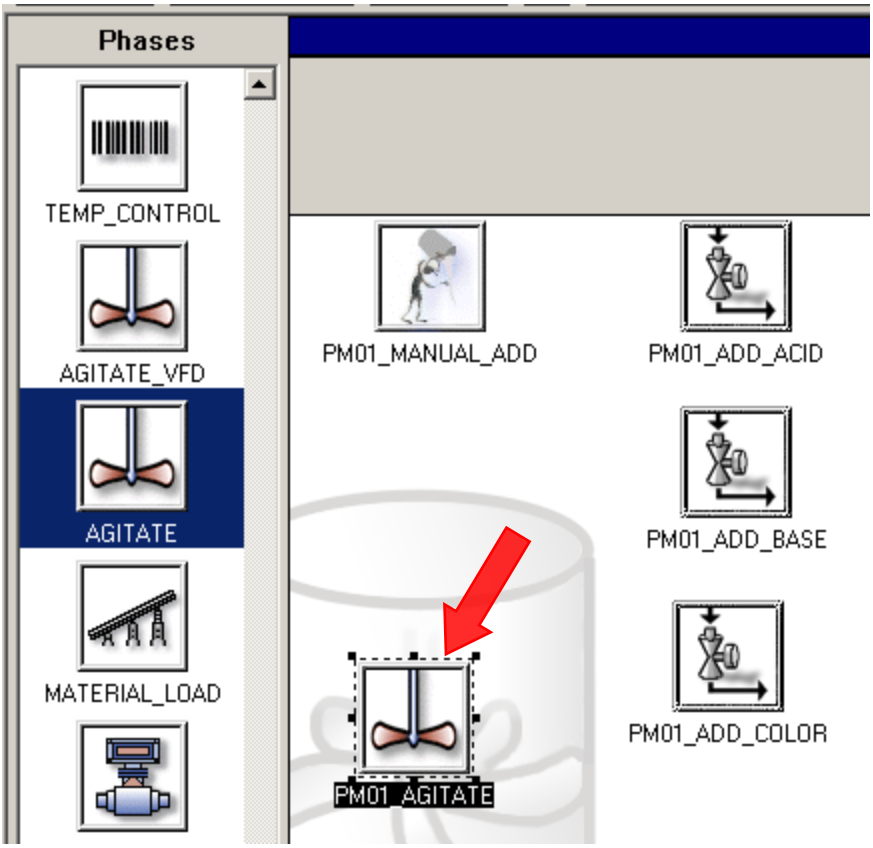
10. Set the Location Bar in the editor window. From the menu, select ***View – Location Bar*** so it is checked. This item acts as a toggle – check/uncheck.



11. Let's edit an existing phase class. Return to the ***PREMIX_01***

unit using the ***Up*** arrow and drilll down into the equipment phase level of the unit. Once there, please select (**single click**) the ***PM01_AGITATE***

equipment phase icon seen below:



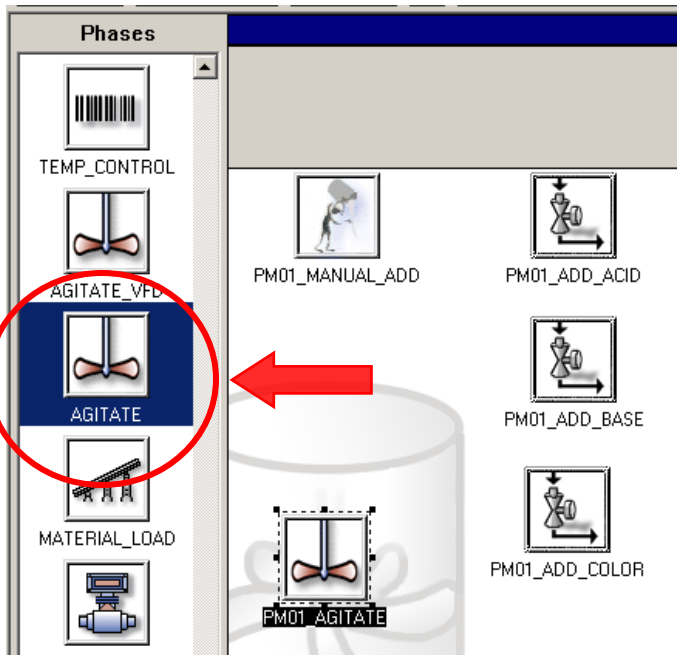
NOTE: When you single click the phase instance, the associated phase class is highlighted on the left. This is the quick way to find the phase class for the specific phase instance.

NOTE: When you double click the phase instance (of a PhaseManager phase), this will launch directly into that phase in your RSLogix5000 project. If you do this, it may take a moment to load the RSLogix 5000 application. The Equipment Editor must be on the same computer as RSLogix5000 and the ACD file to double click on a phase in the area model and have it go to the phase in the RSLogix5000 project.

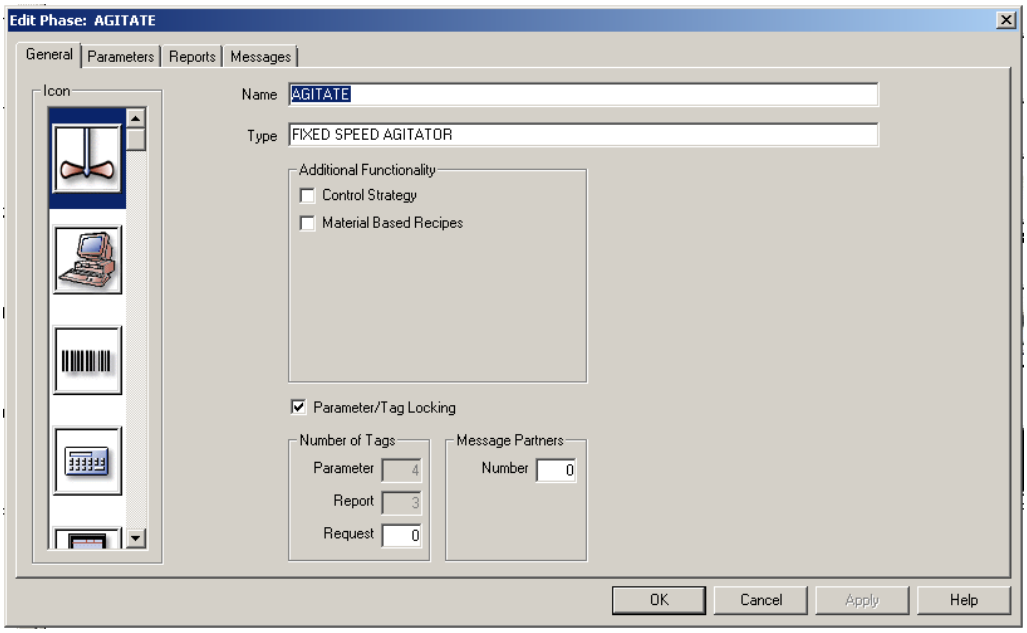
The phase class for the equipment phase instance will become highlighted on the far left:

12. ***Right-mouse click*** on the ***AGITATE*** phase class icon listed under ***Phases*** column at the left to open the phase class configuration window - Edit Phase: AGITATE.

Lab 1: Factory Talk Batch "Basics"



This will bring up the Edit Phase: AGITATE popup window:



NOTE: Phases are the lowest level of procedural elements in the procedural control model. In FactoryTalk Batch, phases are defined as process actions and are configured with Parameters and Reports.

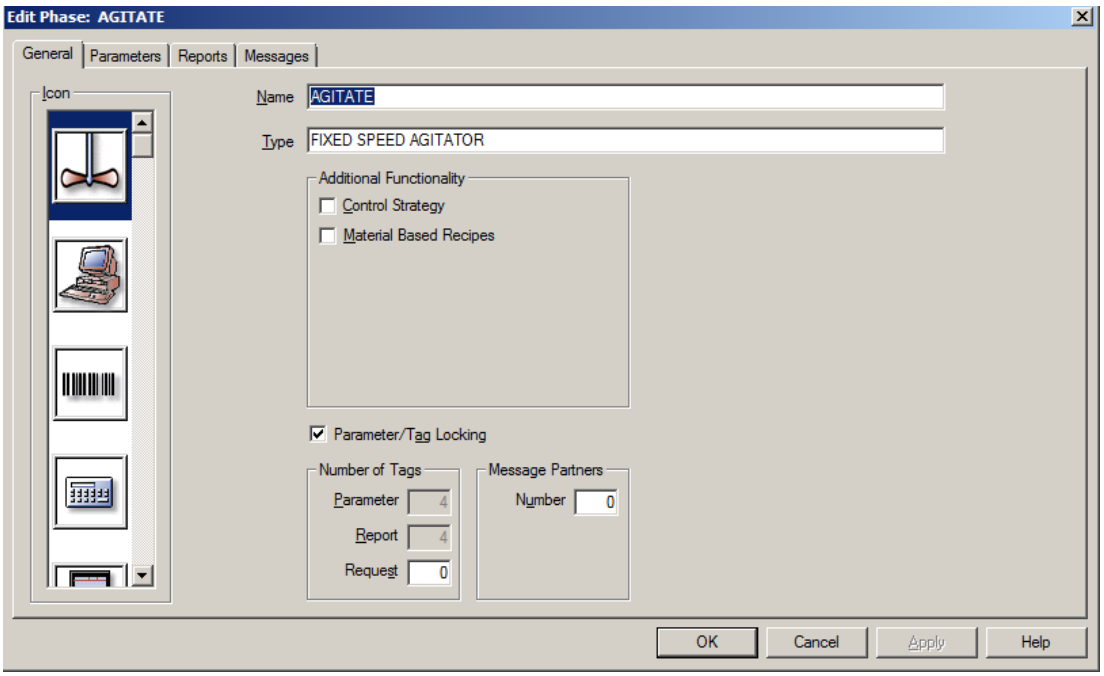
Lab 1: Factory Talk Batch "Basics"

Parameters are used by FactoryTalk Batch to send desired process information (such as amounts, temperatures and flow-rates) to the Process Connected Device.

Reports are used by the Process Connected Device to send actual process information (e.g. material amounts, levels, pressures, temperatures, density, etc.) back to FactoryTalk Batch.

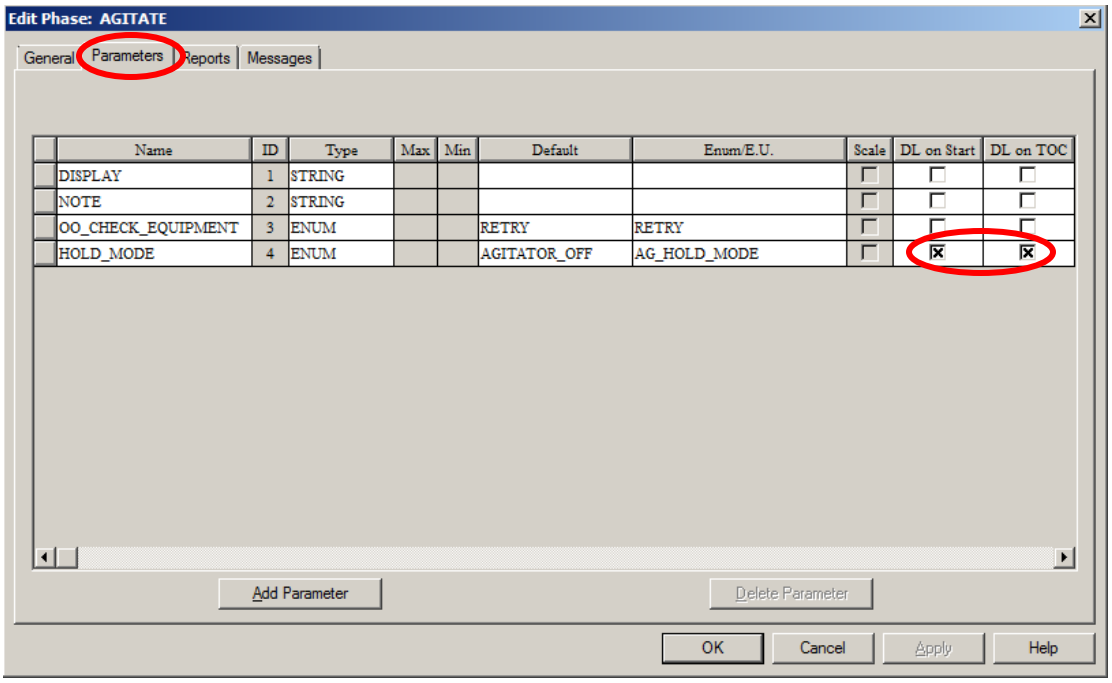
Phases are instantiated on a per unit basis and serve as the building blocks for master recipes.

13. Under the General tab, the user can assign the phase class name, choose an appropriate icon, enable Control Strategy, enable Message Partners, enable Material Based Recipe phase type, configure Tag Locking and define appropriate # of Parameters, Report and Request tags.

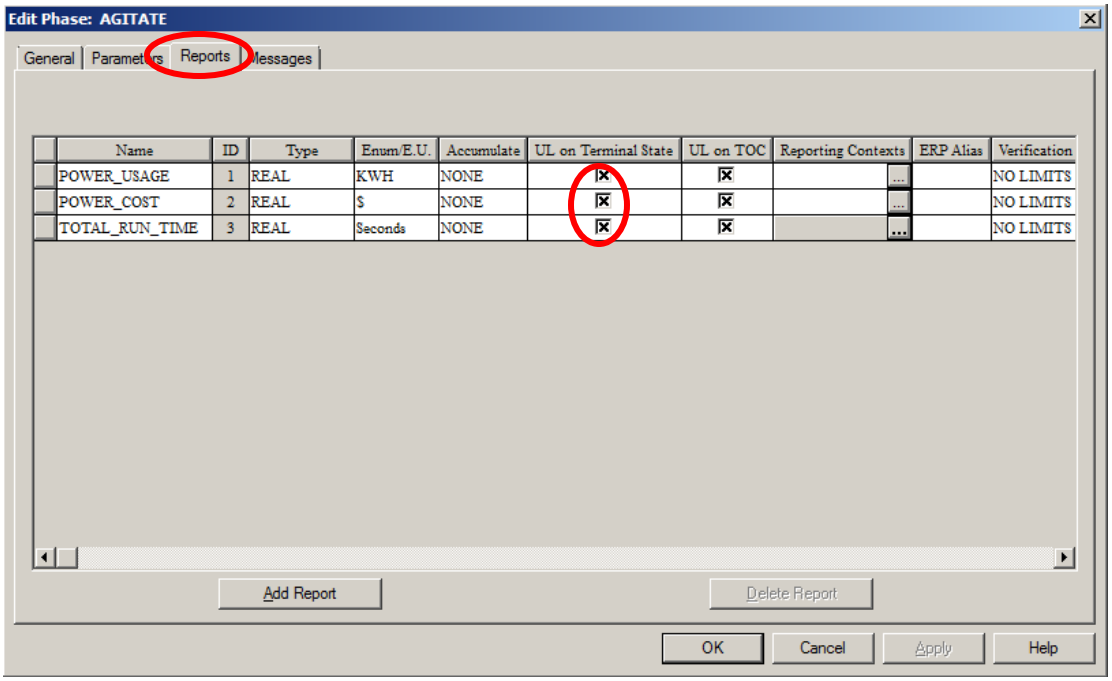


Select the Parameters tab. Four parameters are defined for this agitation phase. Upon starting the agitation phase in the recipe, the batch server will download data from the recipe to the corresponding controller automatically for any parameters with **DL on Start** checked. The parameters that are not define as DL on Start; can be sent by the Batch Server to the controller when the phase logic requests the data.

Lab 1: Factory Talk Batch "Basics"



14. Select the ***Reports*** tab. Three report tags are defined for this agitation phase in the controller. When the agitation phase completes, the batch server will upload data from the controller phase and save it to the batch journal file for all report tags defined as **UL on Terminal State**.



Lab 1: Factory Talk Batch "Basics"

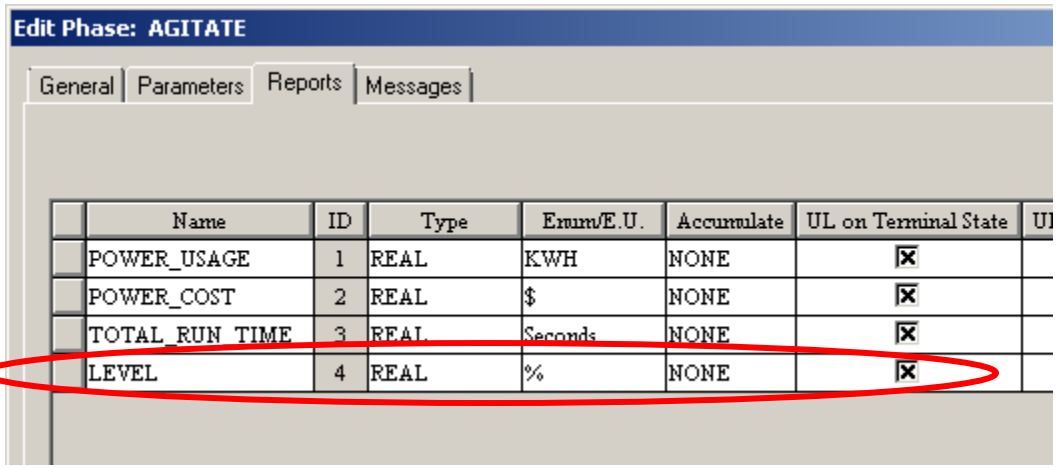
Let's begin with a manufacturing scenario, where quality has recently noticed product issues. They have requested that the tank level be recorded for each agitation step.

> **NOTE:** In your role as engineer, you have identified that a new phase report register must be added to the premix agitation phase class. Since we are already there let's make that change.

15. Near the bottom of the reports tab window on the AGITATE phase class configuration window, please select the ***Add Report***

button

16. Fill out the new report register by entering Name = ***Level*** and Enum/E.U.= ***%***, and check the ***UL on Terminal State*** checkbox.



17. On the configuration window, select the ***Apply***

button, then select the ***OK***

button to make the new change.

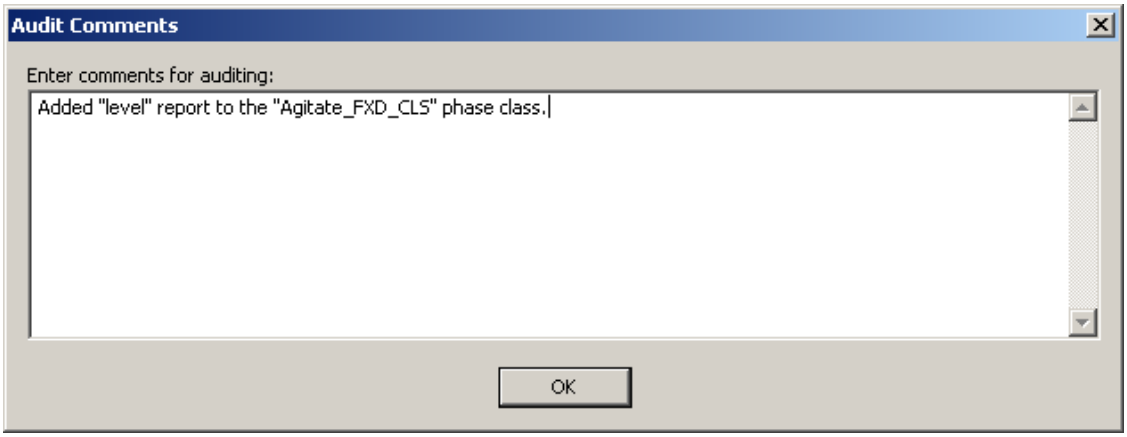
Lab 1: Factory Talk Batch "Basics"

NOTE: The UL on terminal state is the indicator for batch to automatically upload this value when the phase completes. No additional logic is required.

NOTE: You have now successfully added the new value to the batch area model definition. Now we need to update the controller. We will use the phase manager "synchronize" feature to make the change.

18. We need to save the changes. Therefore, save your area model which defines your S88 equipment model. Please select ***File → Save***, from the menu of the Equipment Editor, or use the ***Save*** ***button icon.***

    The "Audit Comments" box will appear. Comments entered here can be viewed in the change log later. If you desire, enter a comment and then select the ***OK***



    Congratulations, you have now made a change in your equipment model which batch server will become aware of upon a service restart. However, the controller and the recipes are not aware of this change. So we have more work to do.

Lab 1: Factory Talk Batch "Basics"

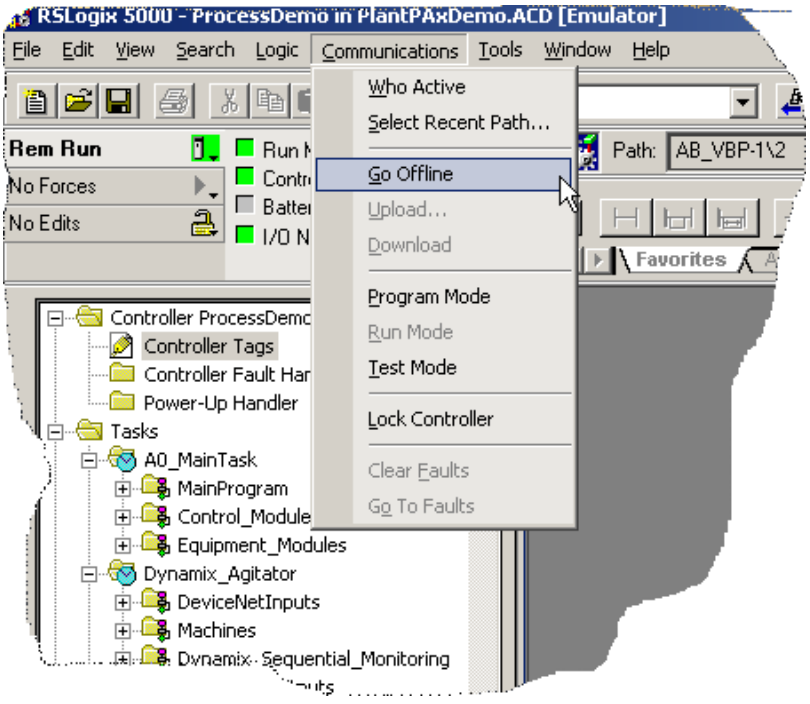
Synchronize Batch & Logix

NOTE: Equipment Phase Synchronization will synchronize equipment in the FactoryTalk Batch Area Model and RSLogix 5000 project file. Synchronization can operate bi-directionally, i.e. synchronize changes in Area Model down to project file, or synchronize changes in project file up to the Area Model. Synchronization will result in building new phase(s) (structure-wise), phase tags (e.g. phase.StepIndex, phase.State, etc.), and phase parameter/report in the DESTINATION automatically. The Phase Tag will be automatically built as a GLOBAL "PHASE" Pre-defined type tag and all phase recipe and report parameter tags will be built local to the phase itself, i.e. each phase will have its own "Phase Tags". Other than the Phase associated recipe and report parameters tags, users may wish to build (declare) more phase specific (local) tags, such as, timer(s), temporary result or calculation buffers, etc. Note: Phase recipe parameter tag(s) will have "Usage" attribute of "Input" and Phase report tag(s) will have "Usage" attribute of "Output".

From the Area model in the Equipment Editor, you will initiate the Synchronization feature to automatically build the PhaseManager phases in the RSLogix 5000 project.

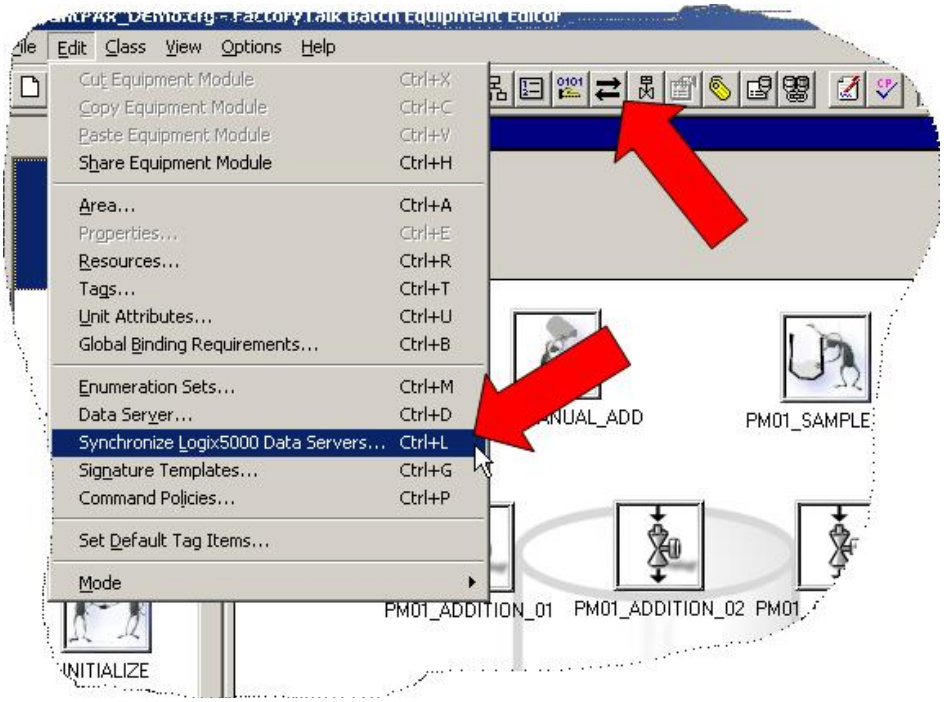
1. First we need to ensure that our Logix file is **offline**. If the Logix 5000 project is open and online, **Alt-Tab** to it or maximize from the windows toolbar.

2. Select the ***Communications*** drop-down, select ***Go Offline.***

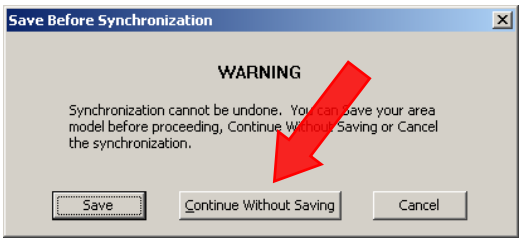


Lab 1: Factory Talk Batch "Basics"

3. Return to the Batch Equipment Editor. To synchronize, click the **Synchronize** toolbar button or select from the menu bar ***Edit > Synchronize Logix5000 Data Servers***.



4. The Save Before Synchronizing warning displays:



Click the **Continue Without Saving** button.

NOTE: We are choosing "Continue Without Saving" for this step because the area model was saved in the last example. Typically, you would choose the "save" option if changes have been made since your last saved.

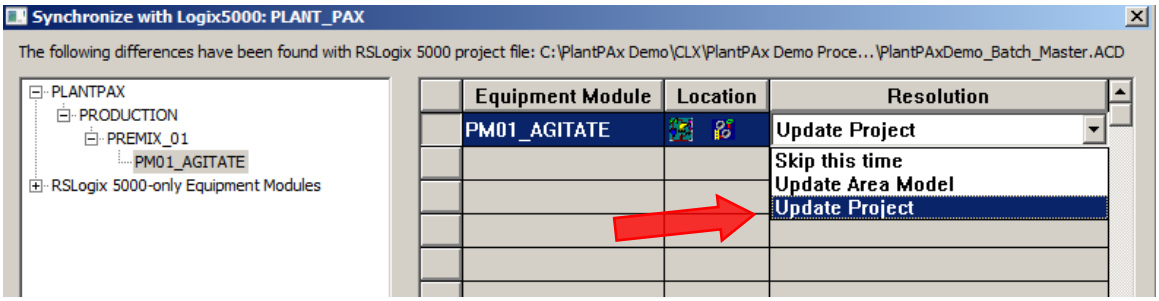
Lab 1: Factory Talk Batch "Basics"

5. Click the **Continue** button on the Synchronize Logix5000 Data Servers popup window. Notice the Status of Last Synchronization – it's Incomplete.

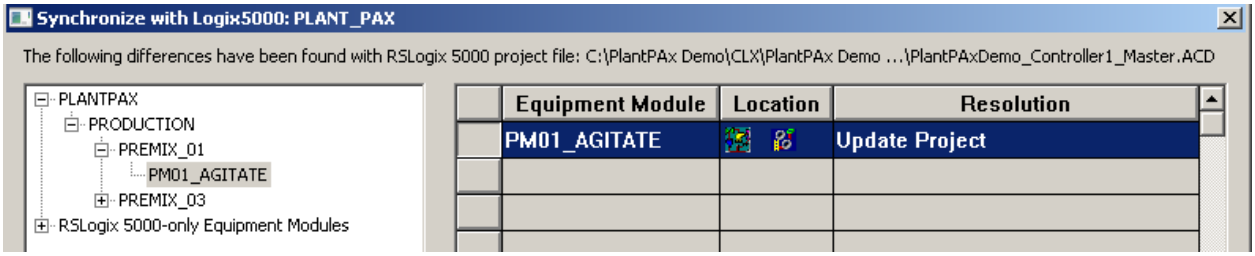
6. After a few seconds the "Synchronize with Logix5000:Plant_PAx" dialog box appears. It knows what has been changed since the last synchronization – PM01_AGITATE.

Lab 1: Factory Talk Batch "Basics"

7. The synchronization tool identified the recent change. Set the Resolution option from 'Skip this Time' to ***Update Project*** for PM01_AGITATE.



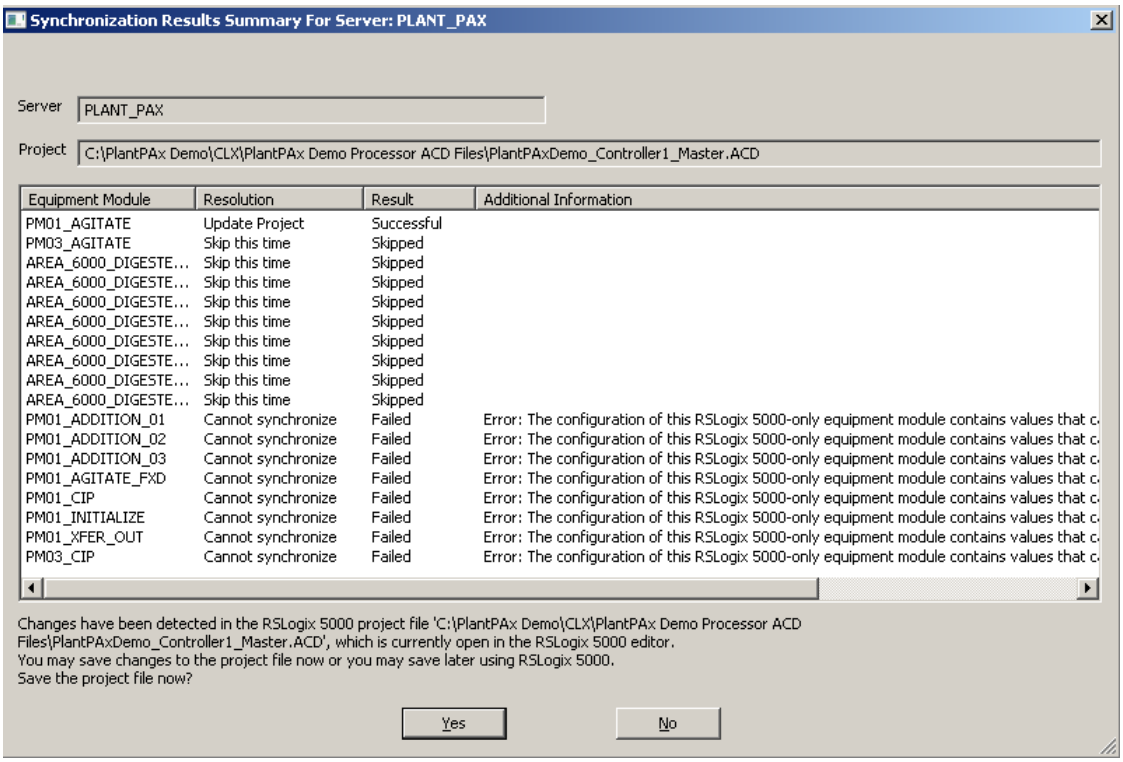
8. Update project will make changes to the ACD controller code so that it has the same components as the area model equipment phase.

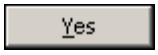


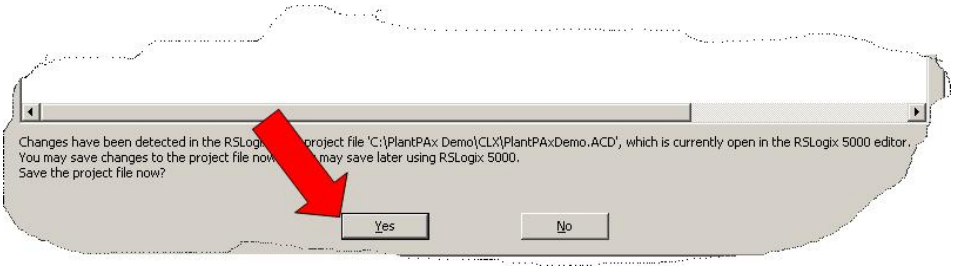
Click the **Synchronize** button at the bottom of this window

9. The following dialog box opens; the PM01_Agitate phase update was successful. The phases that show results of :"Skipped" are phases that were previously used by FactoryTalk Batch, but are now only used by **Logix Batch & Sequence Manager** and can be ignored.

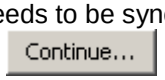
Lab 1: Factory Talk Batch "Basics"



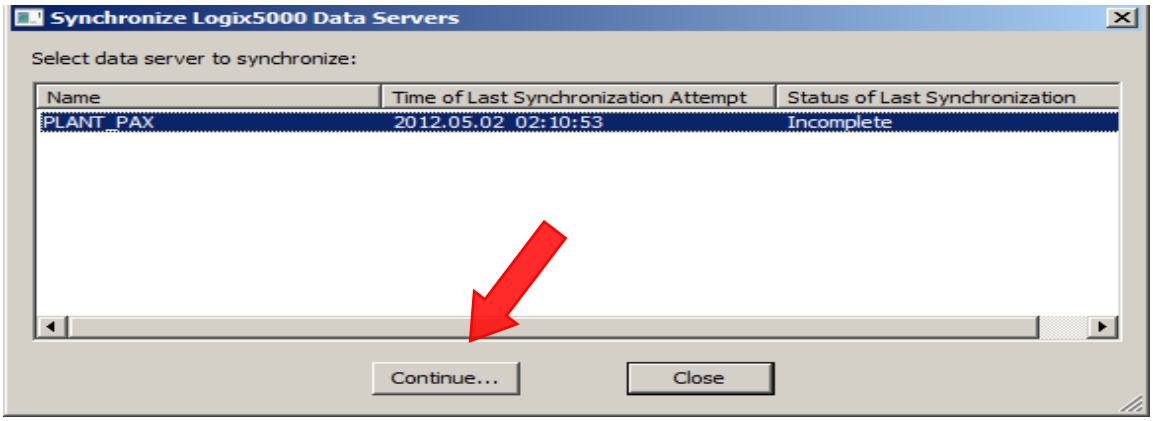
10. Select **YES**  to save changes to the RSLogix 5000 project file, PlantPAx_Demo.

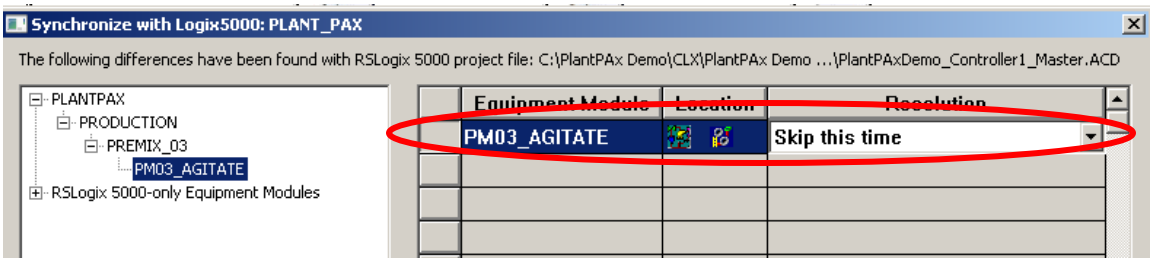


11. Look under the column labeled, Status of Last Synchronization, for the results, a **Complete** status would be displayed if the area model and RSLogix5000 project were completely synchronized, but in our case the status is **Incomplete**

12. The Premix 01 and Premix 03 are class-based units since they came from the same unit phase class for Premix. Therefore, Premix 03 has an agitate phase from the same AGITATE phase class. This phase instance needs to be synchronization with the equipment phase in the controller. Click the **Continue**  button on the Synchronize Logix5000 Data Servers popup window to see which one it is.

Lab 1: Factory Talk Batch "Basics"

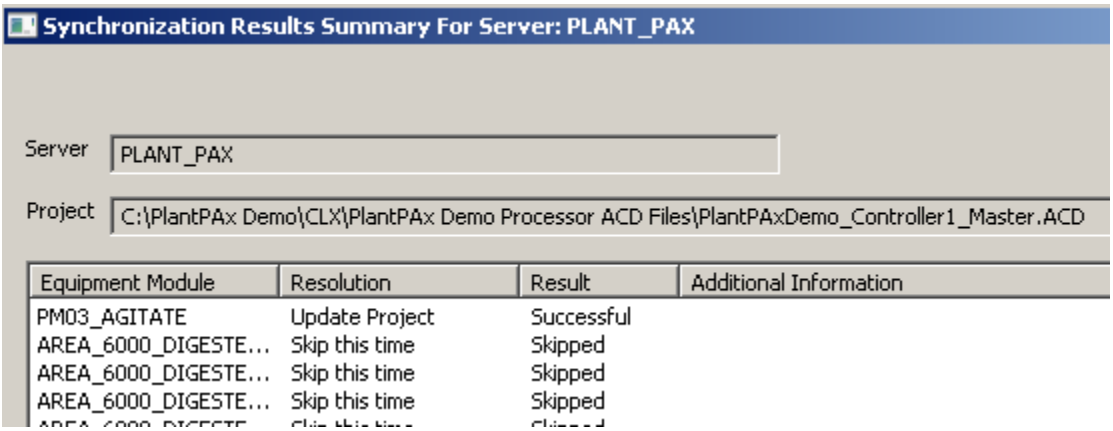




13. It is PM03_AGITATE, change the Resolution to ***Update Project***.

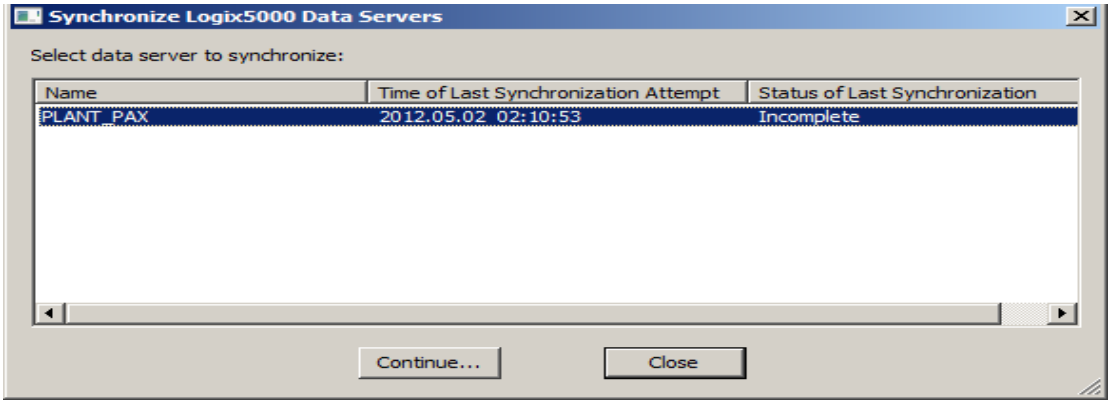
    Click the **Synchronize** button at the bottom of this window

14. The ACD file should get updated for the PM03_AGITATE equipment phase with Result as Successful. You have added a new report tag for this equipment phase in the ACD file. Select **YES** to continue.



Lab 1: Factory Talk Batch "Basics"

15. Notice the Status of Last Synchronization – it's still Incomplete You have completed the synchronization with the two Premix phases. We won't worry about these other equipment phases since we never changed them.

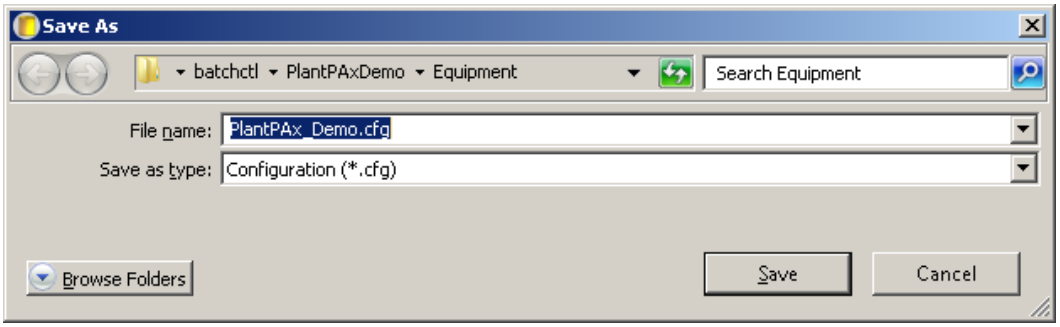


16. Click the **Close** button.

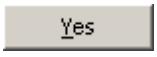
17. Click the **Save** button.

18. When "Save After Synchronization" dialog opens; click the **Save** `button

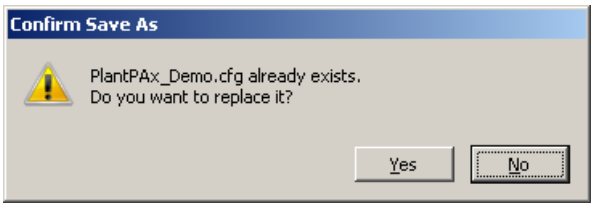
19. The Save As window appears.



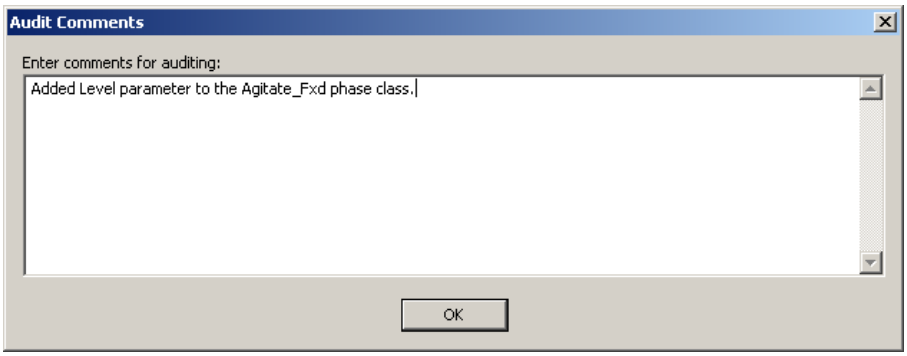
Click the **Save** button.

20. When prompted to "replace"; click the **Yes**  button.

Lab 1: Factory Talk Batch "Basics"



21. Enter a comment for the audit / change record and OK



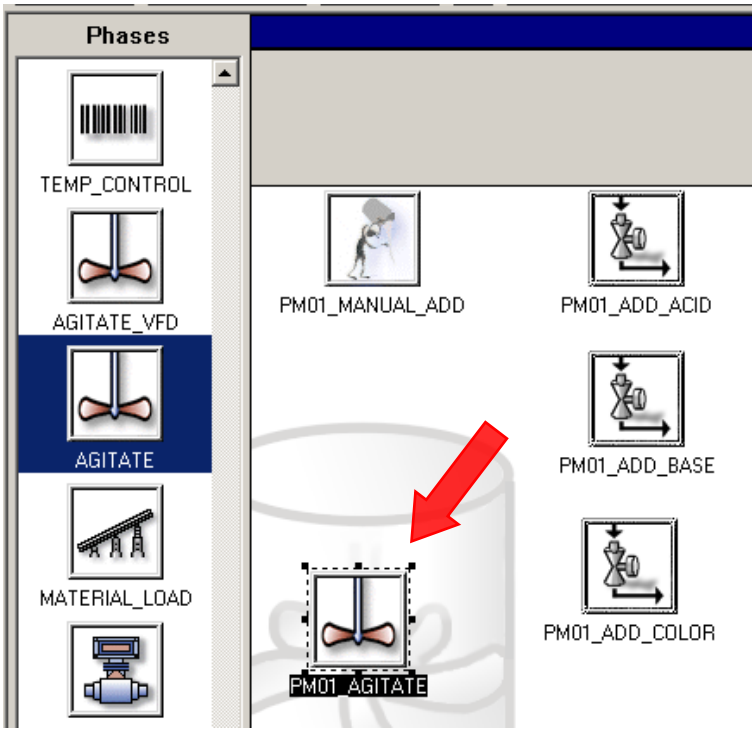
You have now completed synchronization. Now let's look at the controller code.

Lab 1: Factory Talk Batch "Basics"

Editing the Logix Project File

NOTE: For PhaseManager phases it is possible to invoke the RSLogix Editor and the project file through the Equipment Editor. Within the Equipment Editor double-click on the equipment phase to open up the corresponding equipment phase in the RSLogix 5000 project file for viewing and/or editing. However, FactoryTalk Batch Equipment Editor and RSLogix 5000 software must be loaded on the same machine.

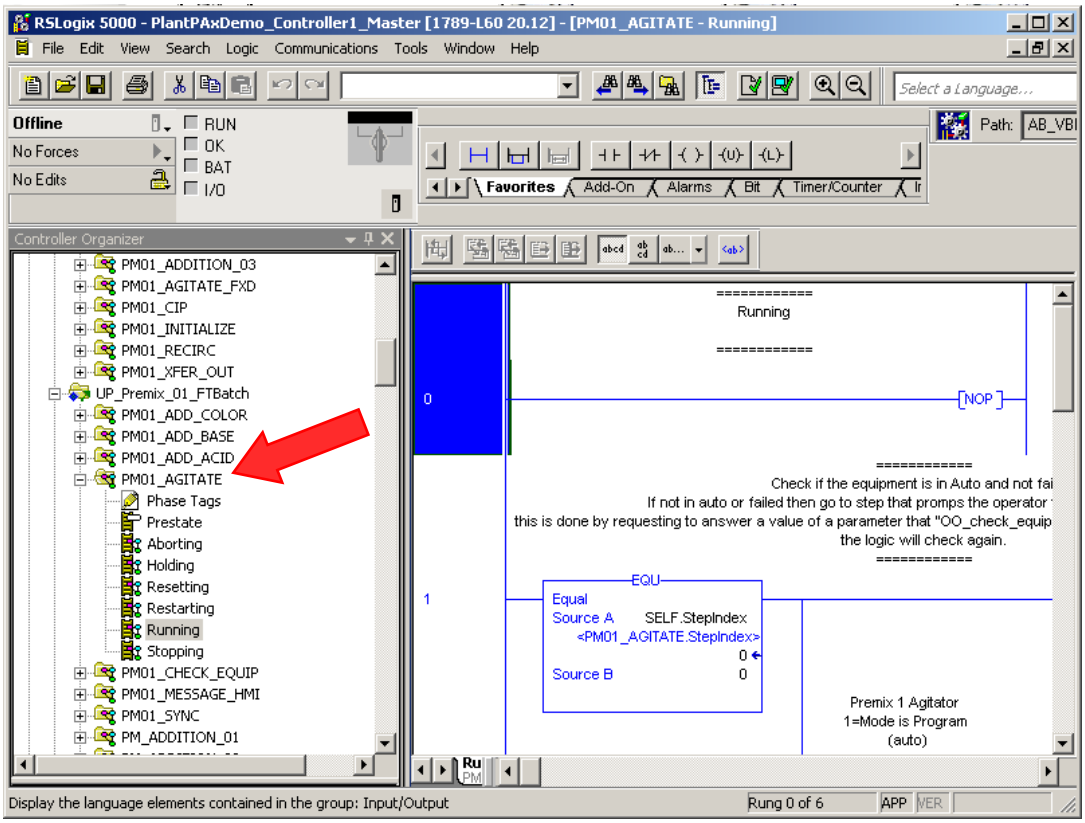
1. Double-click on the **PM01_AGITATE** equipment phase.



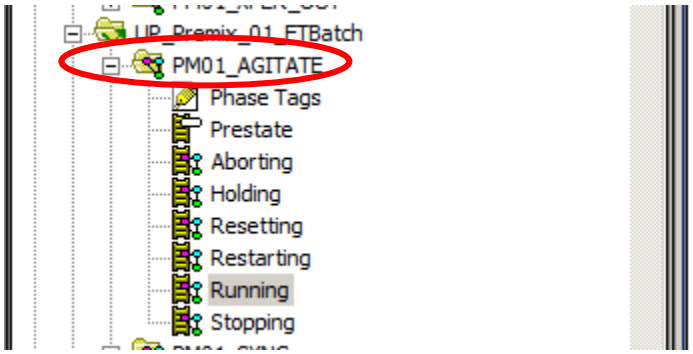
NOTE: New PhaseManager phases are created in the **Unscheduled Programs / Phases** section. It is the responsibility of the engineer to move them into the appropriate task. In addition, it is the engineer's responsibility to implement custom code segments for ISA88 state logic required in the project (Running-, Holding-, Restarting-, Stopping- and Aborting-Logic) for the process task each phase represents. However, there is no need to implement and support Phase Logic Interface code (i.e. PLI) to ensure proper communication, command and state protocols with the Batch Server. There is no longer the need to create associated phase tags for each PhaseManager phase; it is done automatically within the design environment using the CIP protocol.

Lab 1: Factory Talk Batch "Basics"

2. The RSLogix5000 Editor opens directly to the ***PM01_AGITATE*** phase running state routine. You may need to switch over to view the Logix 5000 Editor.

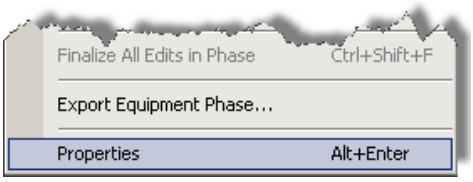


3. In Logix 5000, right-click on the ***PM01_AGITATE*** phase

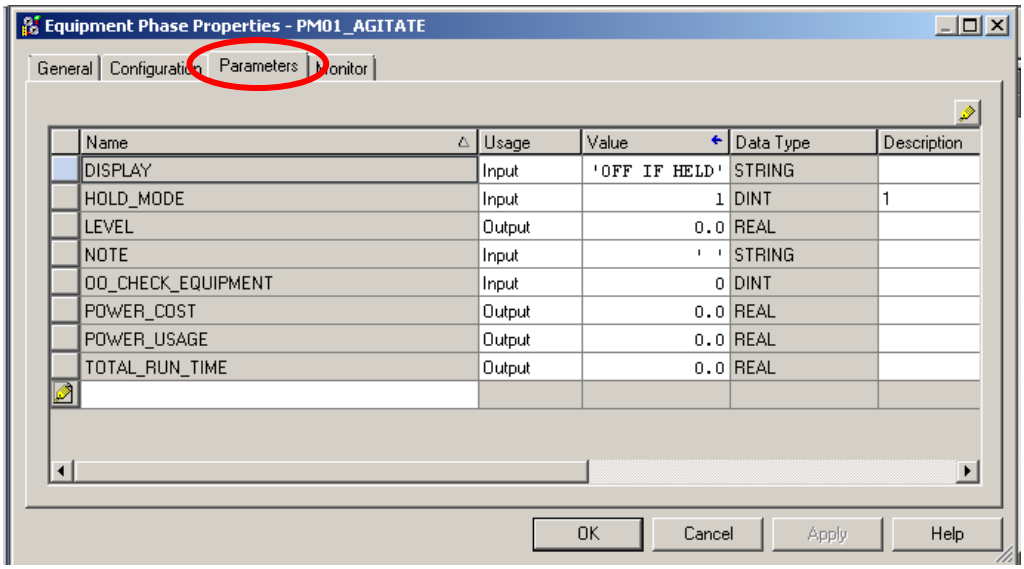


Lab 1: Factory Talk Batch "Basics"

4. Select ***Properties***



5. Switch to the **Parameters** tab.

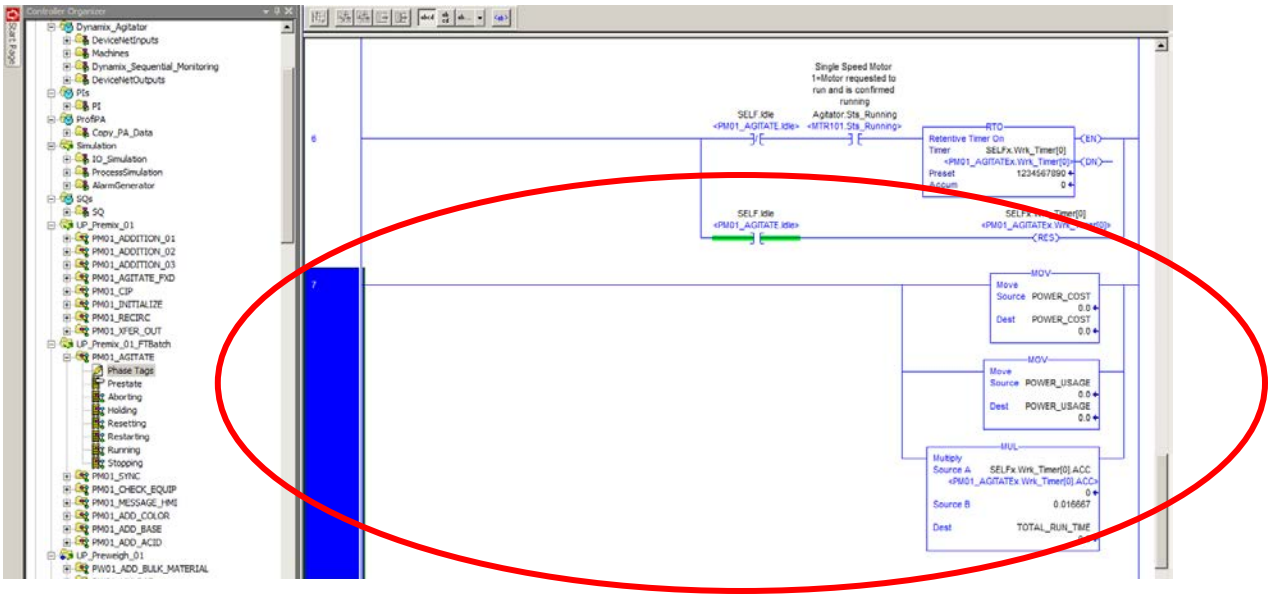


6. Here you can find the Parameters (**Inputs**) and Reports (**Output**) that were originally defined from the Equipment Editor. Note that the new ***Level*** Report (Output) that was created through the synchronization from Batch. You never had to build the tag in the ACD; it was done automatically for you when you synchronized. You could check PM03_AGITATE, but you probably don't have time.

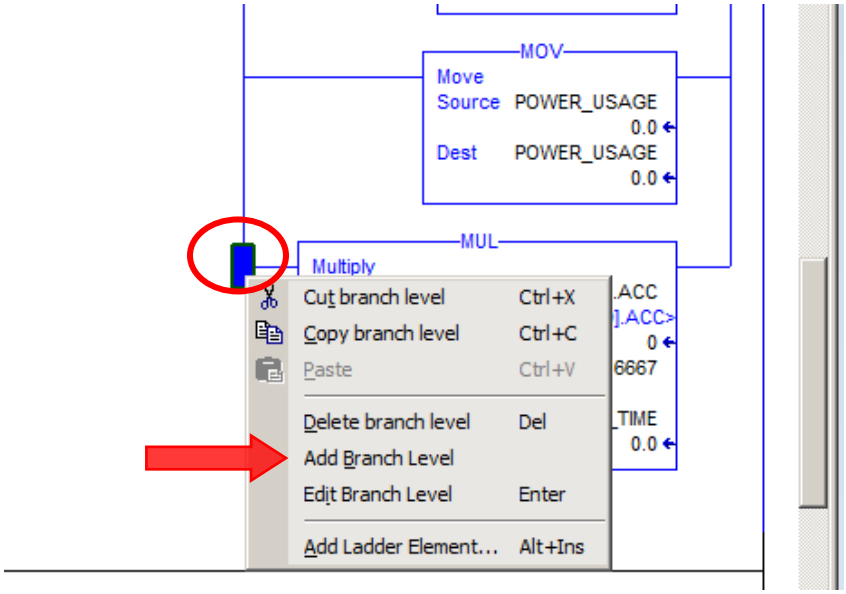
7. Click **Cancel** to close this dialog box. We will now map the Level control module into this report (Output) Tag.

8. The ***PM01_AGITATE*** phase is a non-terminating phase; it never goes to a complete state and is always used in parallel with a phase that does terminate. The report parameters for this phase are updated in the **Prestate** routine. Double-click on the **Prestate** routine to open it, and **Scroll down** to **rung 7**.

Lab 1: Factory Talk Batch "Basics"

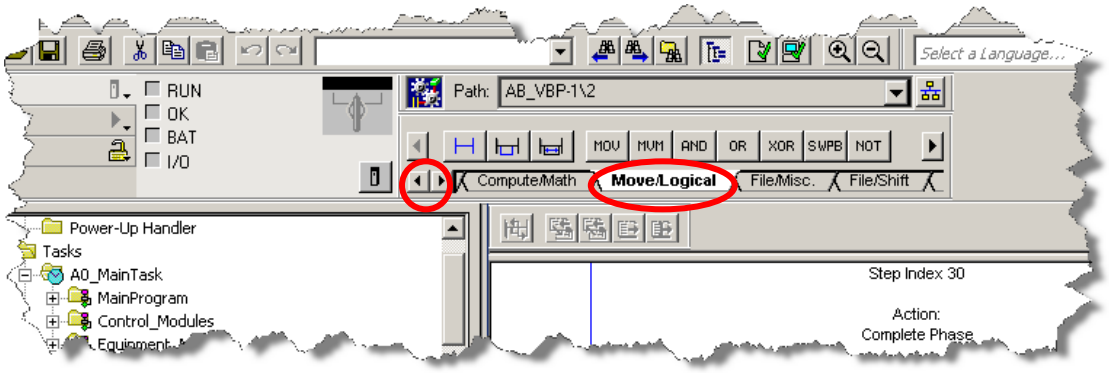


9. Right-click to the left of the last **MUL** instruction at bottom and select **Add Branch Level**.



Lab 1: Factory Talk Batch "Basics"

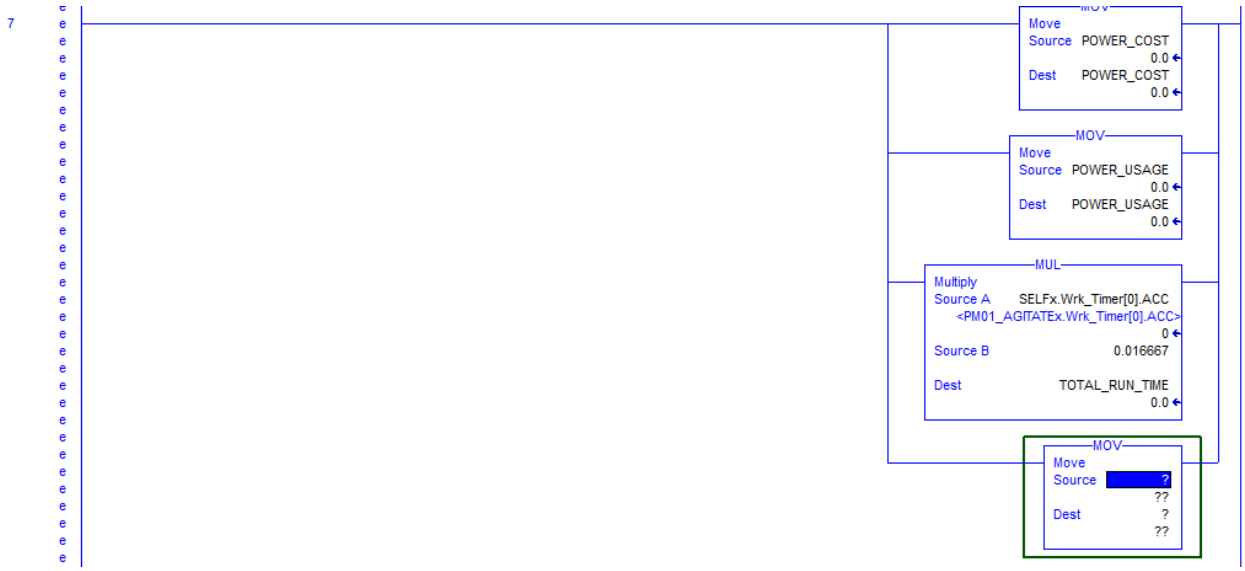
10. From the toolbar, click the ***Right Arrow*** to scroll to the ***Move/Logical*** instruction set.



11. Click the ***MOV*** instruction from the list.

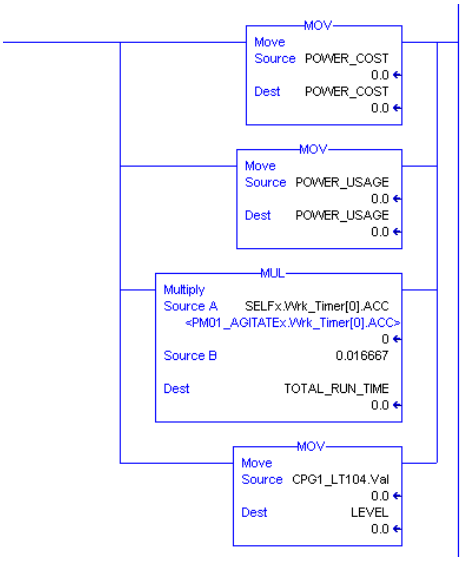
Lab 1: Factory Talk Batch "Basics"

12. The MOV instruction will be added to the **rung 7**.



13. Double-Click in the ***Source*** box and enter ***CPG1_LT104.Val***

14. Double-Click in the ***Dest*** box and enter ***LEVEL*** - when finished it should look like this:



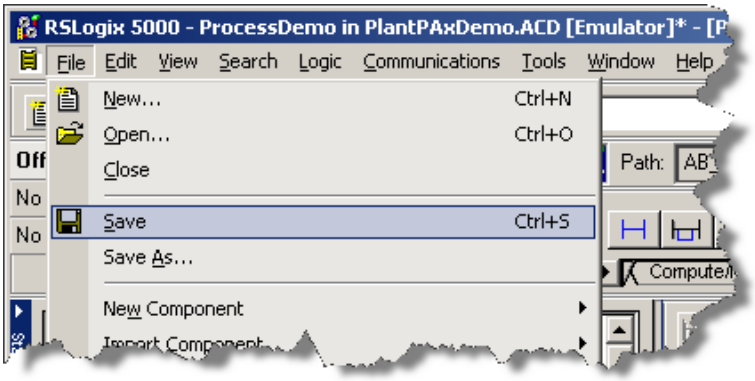
NOTE: CPG1_LT104.Val is the control module tag address for the Premix 01 Level. LEVEL is the PM01_AGITATE phase Report (Output) tag. By adding this single instruction to the phase manager code, the batch engine will record the tank level when the phase stops.

Lab 1: Factory Talk Batch "Basics"

15. Verify the routine using the icons to be sure there are no errors.

16. Please repeat these steps for ***PM03_AGITATE*** using ***CPG1_LT404.Val*** as the level to be reported.

17. From the menu, select ***File → Save.***

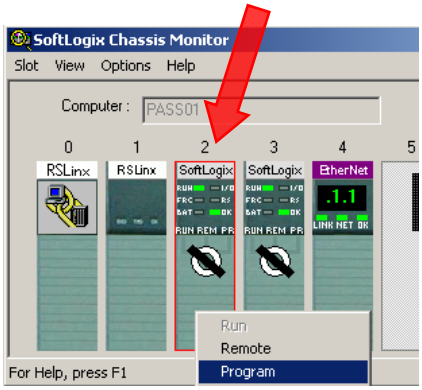


Lab 1: Factory Talk Batch "Basics"

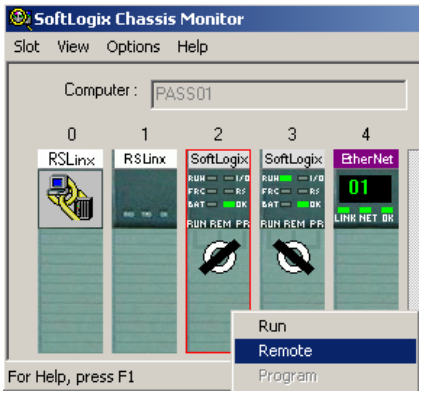
Finalize Edits

To continue we will need to download the new code to the Controller are restart the batch server.

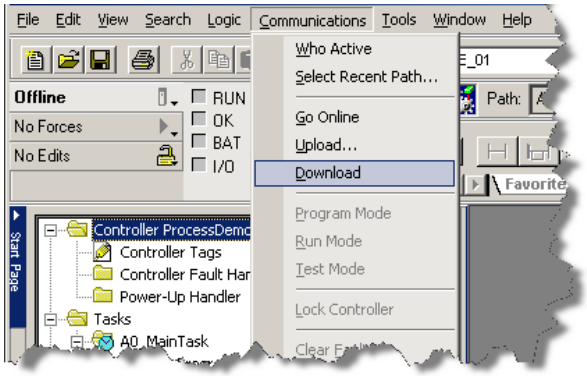
18. On SoftLogix place the controller for Slot 2 into ***Rem-Program*** mode by right-mouse clicking on the controller slot an setting into ***Program***.



Next, place into ***Remote***

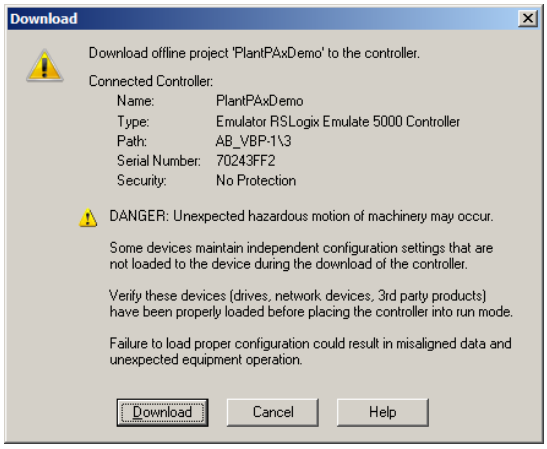


19. From the communications menu in RSLogix 5000, select ***Communications > Download***.

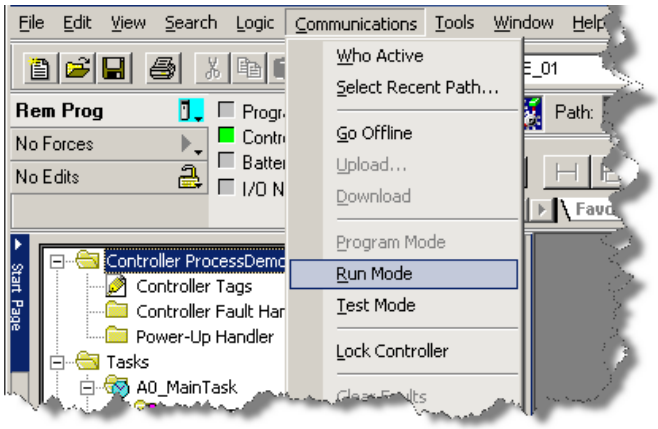


Lab 1: Factory Talk Batch "Basics"

20. Select ***Download***



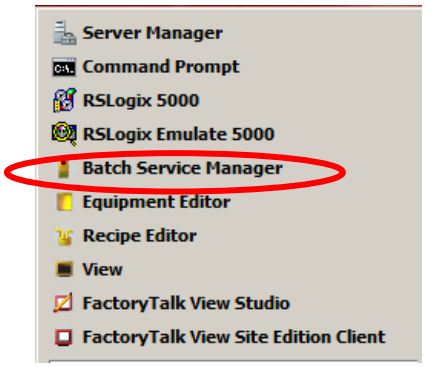
21. From the communications menu, select ***Run Mode***. If the controller faults, clear the fault and try again.



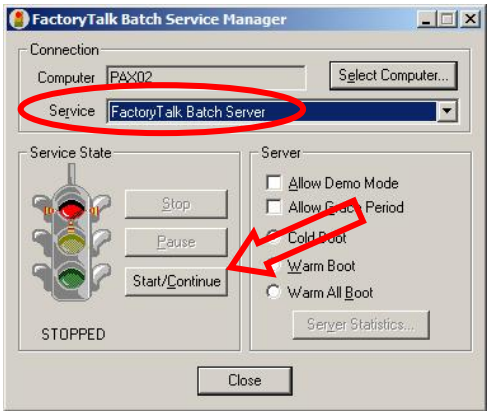
22. ***Minimize*** RSLogix5000.

23. From the start menu, open Batch Service Manager

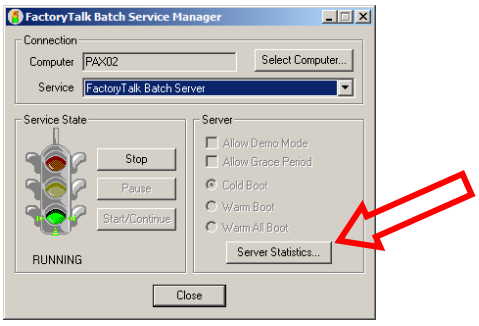
Lab 1: Factory Talk Batch "Basics"



24. From the Batch Service Manager drop-down, select ***FactoryTalk Batch Server*** service and press the ***Start*** button.

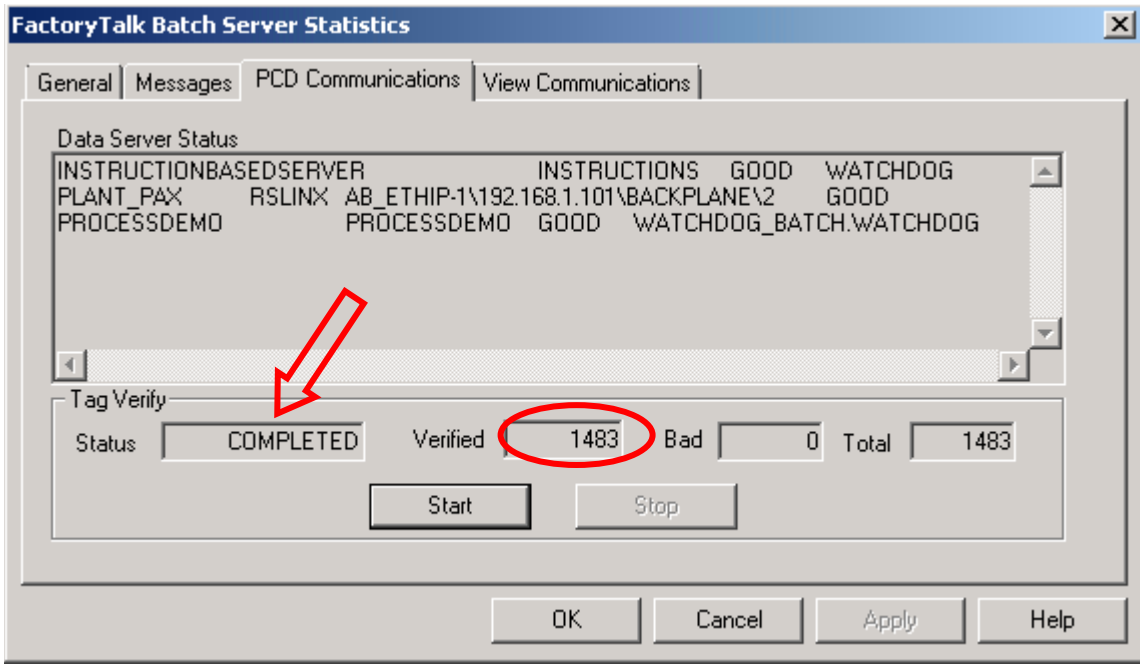


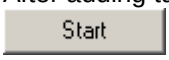
25. When the Batch traffic lights turns green, select the ***Server Statistics*** button.



26. The server statistics window will open. Select the ***PCD Communications*** tab, *Verify* that all three lines indicate ***GOOD*** status. This may take a few moments to transition to good status.

Lab 1: Factory Talk Batch "Basics"



After adding tags to the project it is always good to verify all tags, to do this press the Start 

button. You should have 0 bad tags. If you do not, and you need help, ask your lab assistants.

Notice that the tag count has been increased by 2 (1481 to 1483) as a result of adding the two new Agitation "Level" tags in the Premixers.

27. Select the Cancel

button to close the Server Statistics window, then

28. ***Close*** the Service Manager.

The Engineer's Perspective is now complete!

If you choose, you can re-run the modified recipe by following the Operator's perspective. But due to lab time constraints, we will move to the next section.

Lab 1: Factory Talk Batch "Basics"

R&D (Recipe Author) Perspective

The goal of an ISA88 based batch management & control system is to separate the recipe from the equipment. This user perspective will demonstrate how you as a recipe author can create and edit recipes (both procedure and formula) independent of the plant floor equipment. Optimize unit selection in your running system with the "smart binding" feature.

The Requested Recipe Changes

Lab tests have shown that the agitation speed for "Product_A" is too high for the reactors. Our first task will be to lower that speed. Further tests have shown that we can improve batch cycle time by adding both the premix material and header material to the reactor at the same time. Currently they add sequentially one after the other.

Production and maintenance would like to utilize the smart binding feature. Production would like to optimize the reactor selection process by selecting the warmest reactor for the next batch. Therefore we will need to add a Smart Binding Preference that looks for the warmest vessel (maximize temperature).

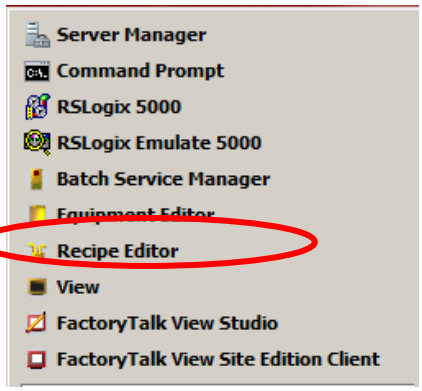
Maintenance has recently added an indication for reactor "In-Service". They would like the batch system to prevent production on those reactors when this indicator is off. Although this is not intended to be used as a safety mechanism, it does offer an easy way for the batch system to exclude reactors from use while scheduling batches. Therefore we will need to add a Smart Binding Requirement to only use "In-Service" reactors.

Batch Recipe Editor

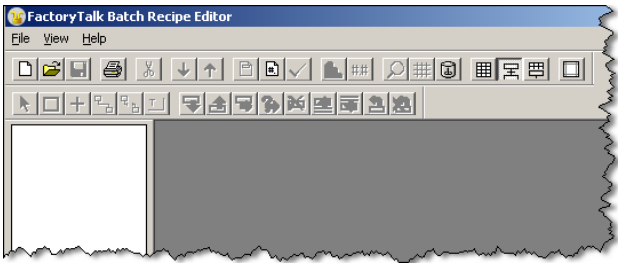
The Batch Recipe Editor is used to create and configure master recipes for use in batch automation. The interface is based on IEC 1131-3 sequential function charts to graphically organize recipe procedures into procedures, unit procedures, operations, and phases.

Lab 1: Factory Talk Batch "Basics"

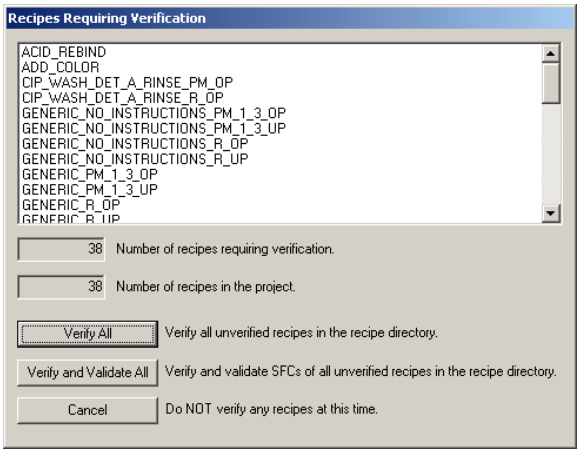
1. From the start menu, open FactoryTalk Batch Recipe Editor, ***Start > Batch Recipe Editor***.



2. The Recipe Editor application opens.



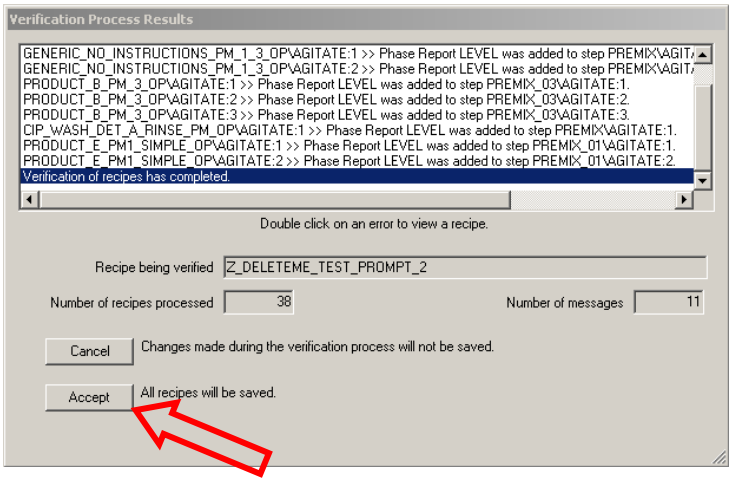
3. If prompted to "Verify" recipes, select the ***Verify and Validate All*** button.



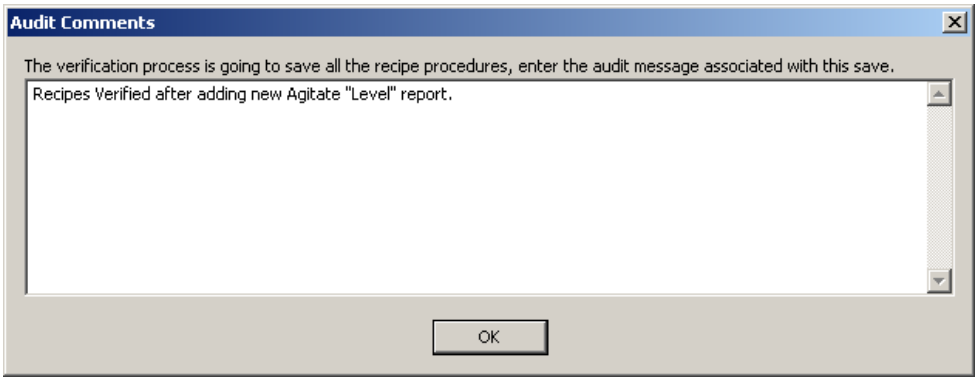
NOTE: The "validate" option was added to FactoryTalk Batch v10 and enhanced in v11. This option will check the SFC structure for common invalid structures between "AND" and "OR" branches. This feature will detect those structural errors prior to running the batch in production.

Lab 1: Factory Talk Batch "Basics"

4. Since we just completed making changes to the Agitate phase in the previous section, the recipe editor needed to re-verify all recipes containing this phase. When complete, select the ***Accept*** Accept button. We will ignore any other messages at this time.

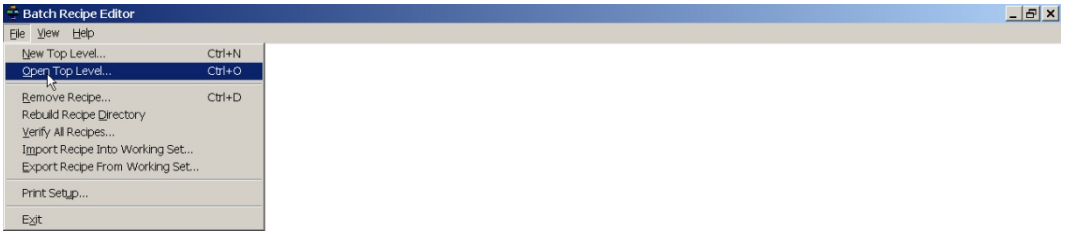


5. The recipe editor will prompt you to enter comments prior to saving the recipes. Enter any text you choose and select the ***OK*** OK button.



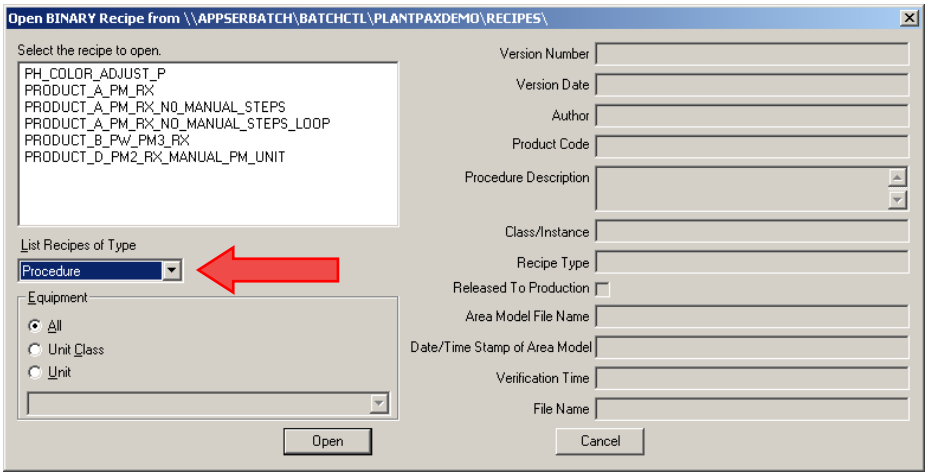
6. From the verification window, select the ***Close*** Close button

7. Select ***File > Open Top Level*** from the Recipe Editor File Menu.

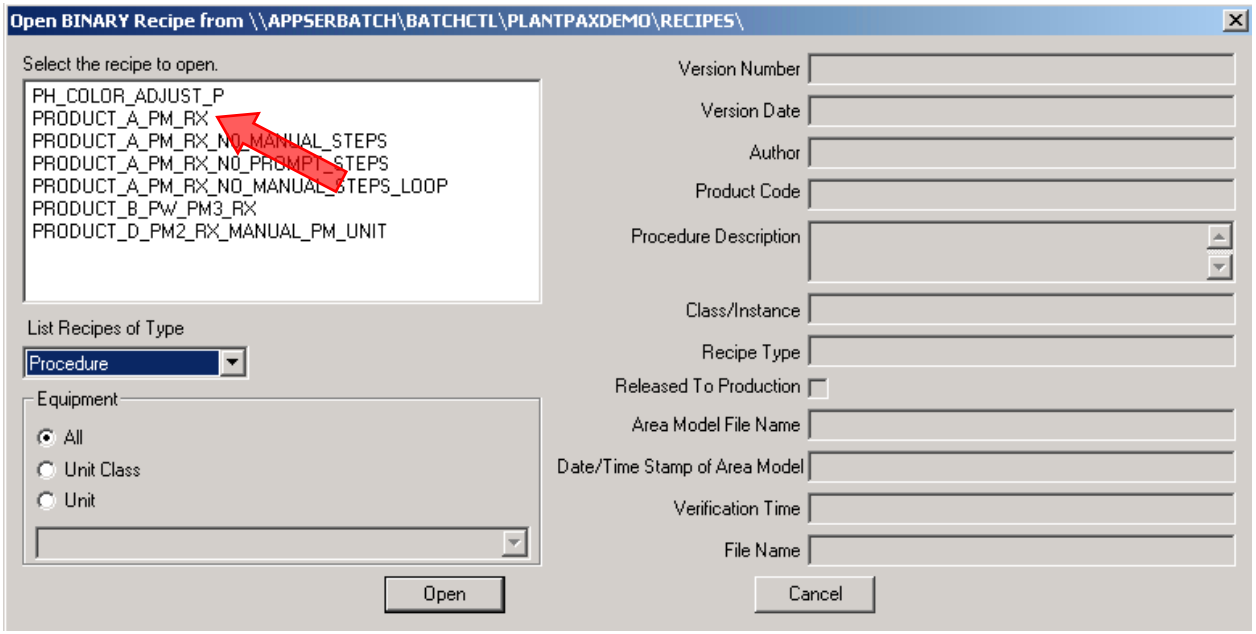


Lab 1: Factory Talk Batch "Basics"

8. When the Open Binary Recipe dialog opens, select a filter on ***Procedure*** from the "List Recipe of Type" drop down menu to change what recipes to select.

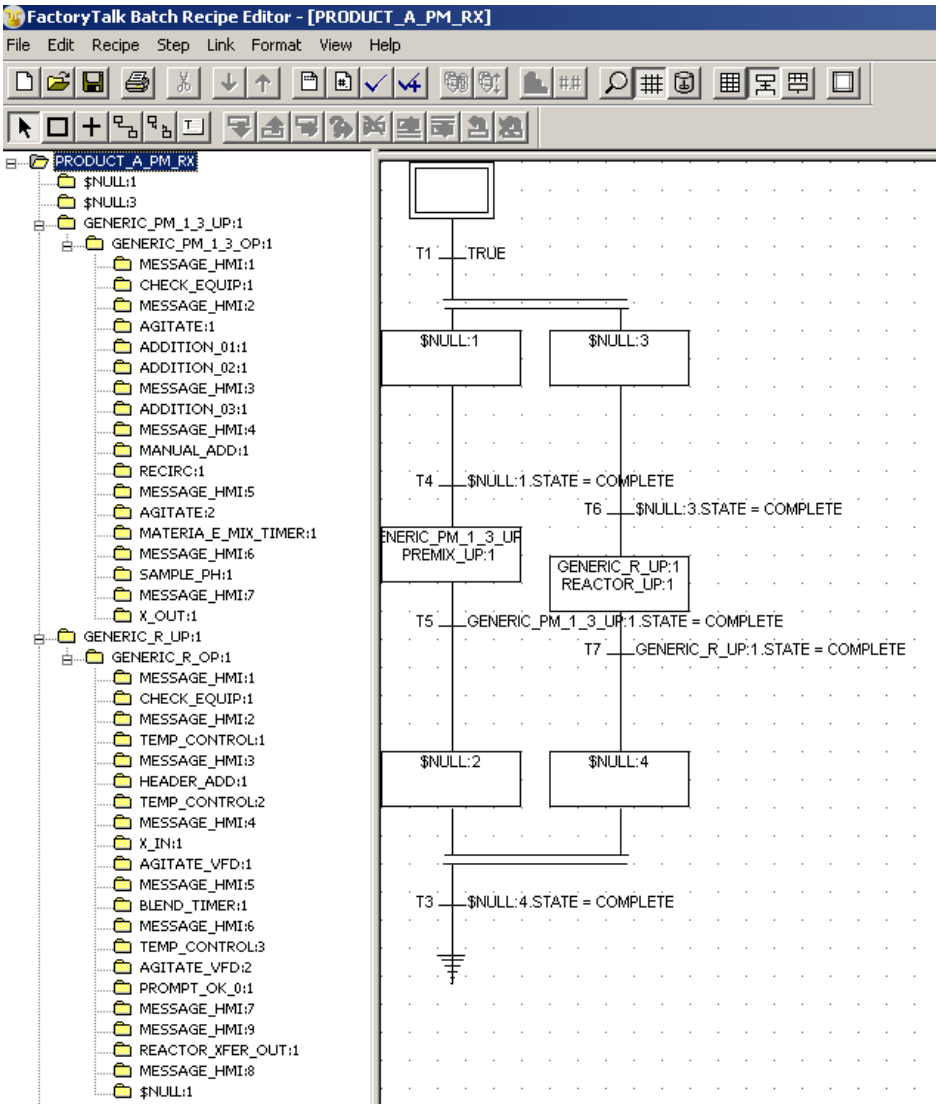


9. Select the ***PRODUCT_A_PM_RX*** procedure and select the ***Open*** button.



Lab 1: Factory Talk Batch "Basics"

10. The "Product_A_PM_RX" procedure level master recipe will open.



NOTE: This master recipe (procedure) consists of two sub-recipes (unit procedures): one for "Premix" and one for "Reactor". Each unit procedure defines the process for making a portion of the product in the specific vessel. To produce "Product A", a mixture is first batched in the Premix vessel, and then transferred to the reactor.

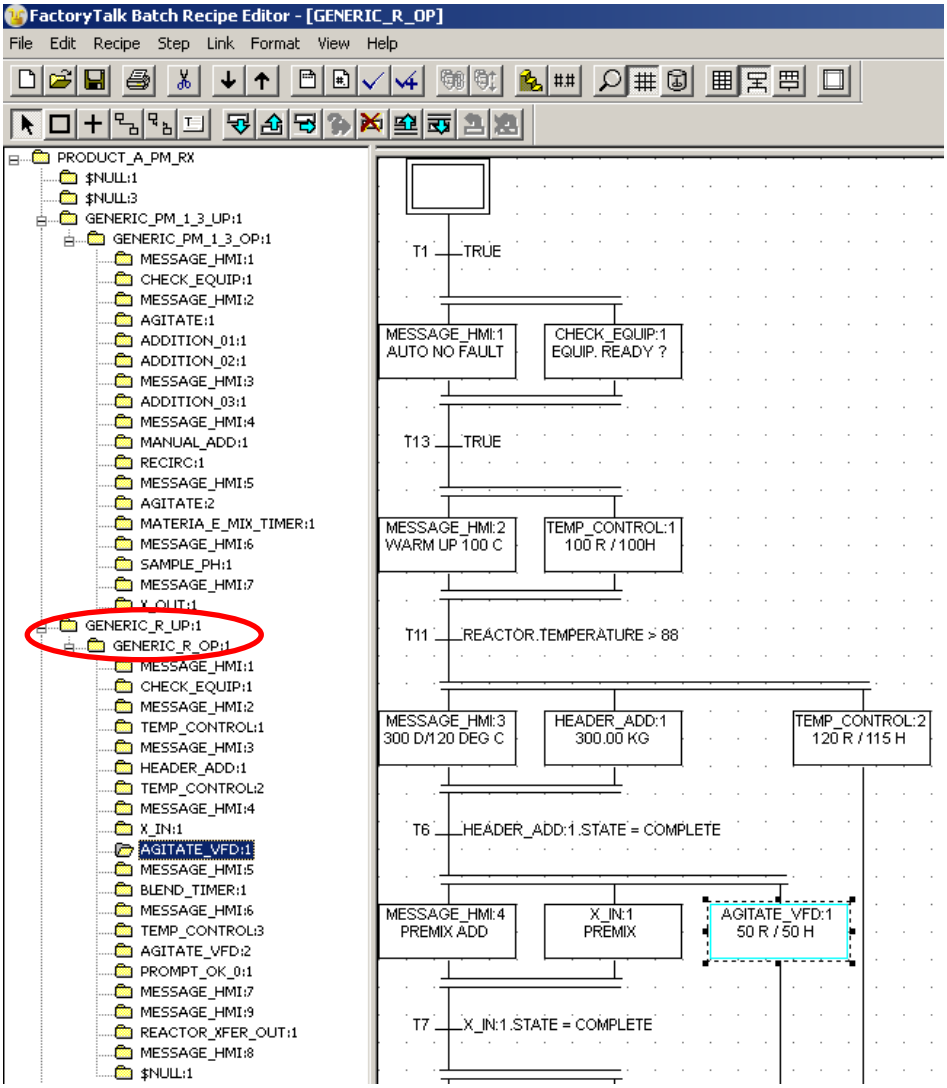
Lab 1: Factory Talk Batch "Basics"

View & Edit Batch Recipe

Now let's make our first recipe update: change the agitation speed from 50 to 43 RPM.

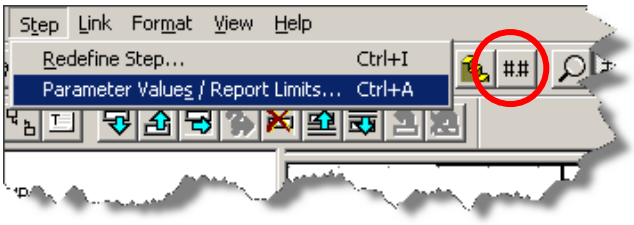
1. From the windows "tree view" on the left hand side, Under the ***GENERIC_R_UP:1/ GENERIC_R_OP:1*** folder, select the ***AGITATE_VFD:1*** step.

   Be careful, there is also an Agitate step under the Premix unit procedure and a second Agitate under the Reactor unit procedure.

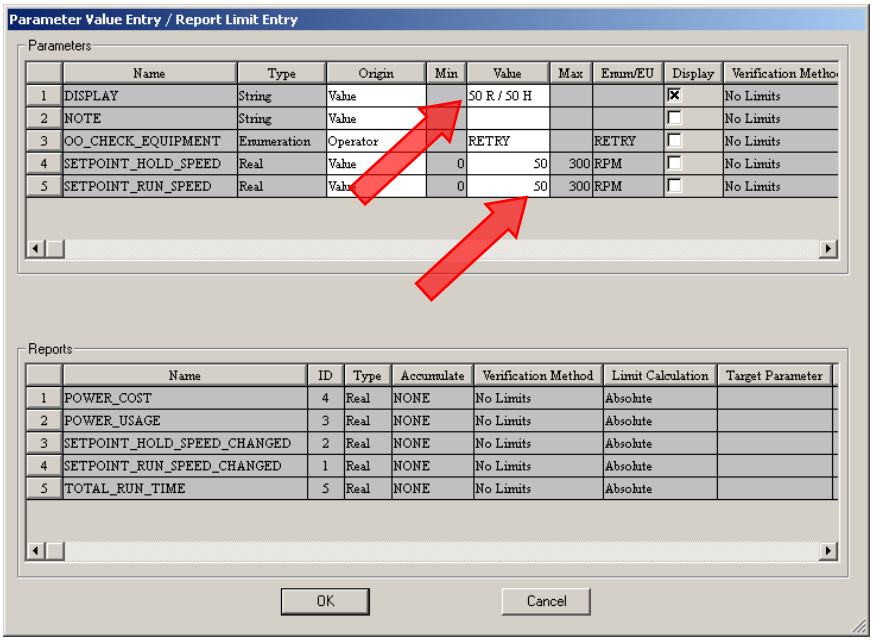


2. The recipe editor will take you directly to the SFC step. From the menu select ***Step → Parameter Values/Report Limits*** or from the toolbar, select the ***Value Entry*** button.

Lab 1: Factory Talk Batch "Basics"



3. The "Parameter Value Entry" screen will appear. Change the ***SETPOINT_RUN_SPEED*** value from 50 to ***43,*** and change the ***DISPLAY*** value from ***43R/50H***.



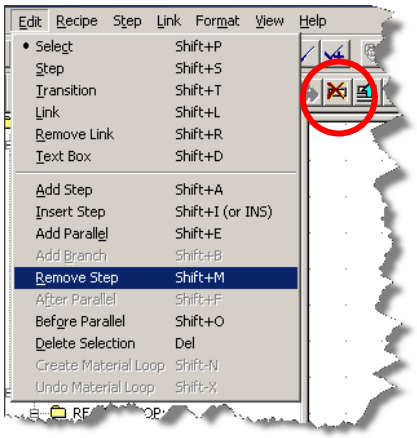
4. Select the ***OK*** button. The recipe now shows 43R/50H on the step display.

Now let's make our second recipe update: Remove then add header material at the same time as the premix material.

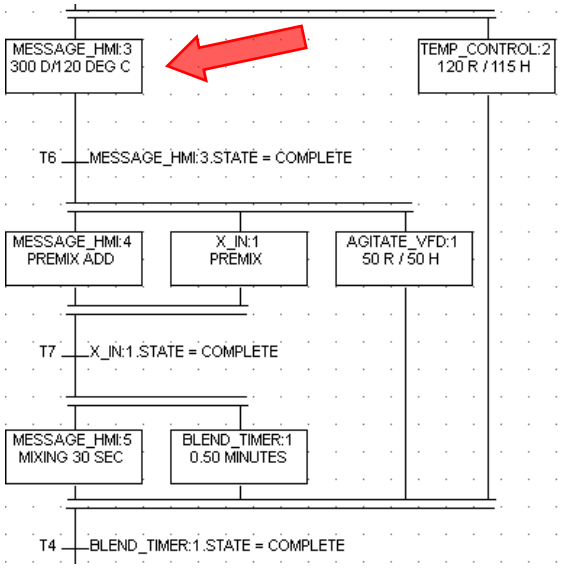
5. Select the ***HEADER_ADD:1*** phase step in the REACTOR_OP:1 operation.

6. From the menu select ***Edit → Remove Step,*** or from the toolbar, select the ***Remove Step*** button. Note that the amount being added was 300 LBS.

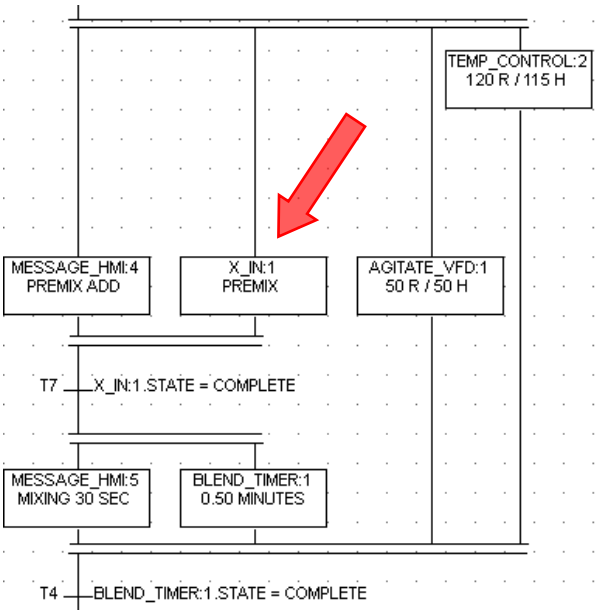
Lab 1: Factory Talk Batch "Basics"



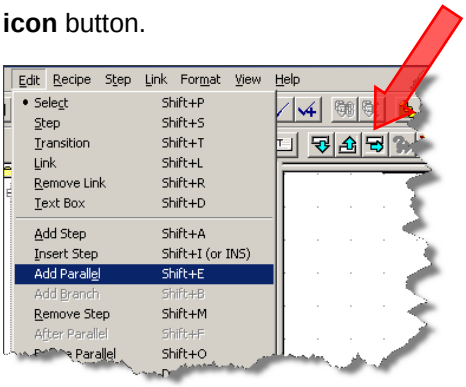
7. The recipe step has now been removed. Now, select the ***MESSAGE_HMI:3*** step From the menu select ***Edit → Remove Step,*** or from the toolbar, select the ***Remove Step*** button.



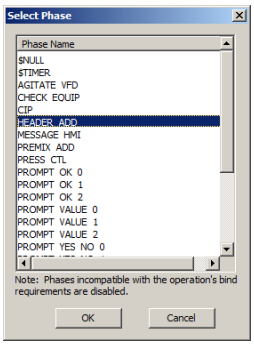
8. The recipe step has now been removed. Next, select the ***X_IN:1*** step.



9. From the menu select ***Edit → Add Parallel,*** or from the toolbar, select the ***Add Parallel*** **icon** button.



10. The "Select Phase" popup will appear. Select ***HEADER_ADD*** from the list

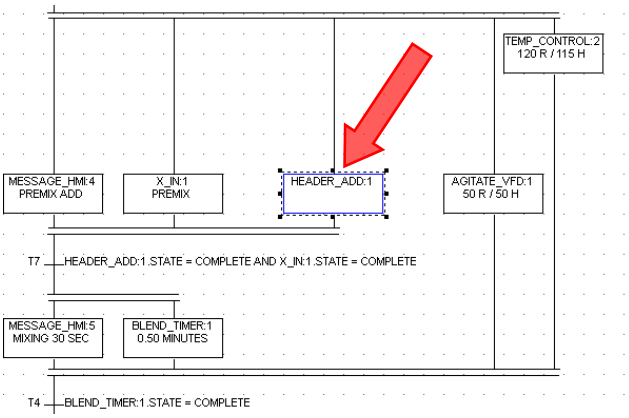


Lab 1: Factory Talk Batch "Basics"

11. Select the ***OK***

button.

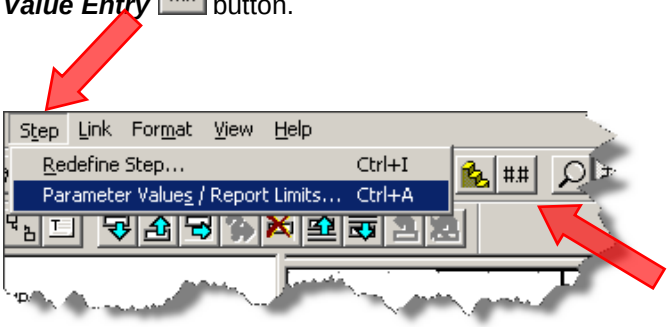
12. You have now added updated the recipe sequence to add the header material at the same time as the premix material.



13. Next, select the ***HEADER_ADD:1*** step that you just added.

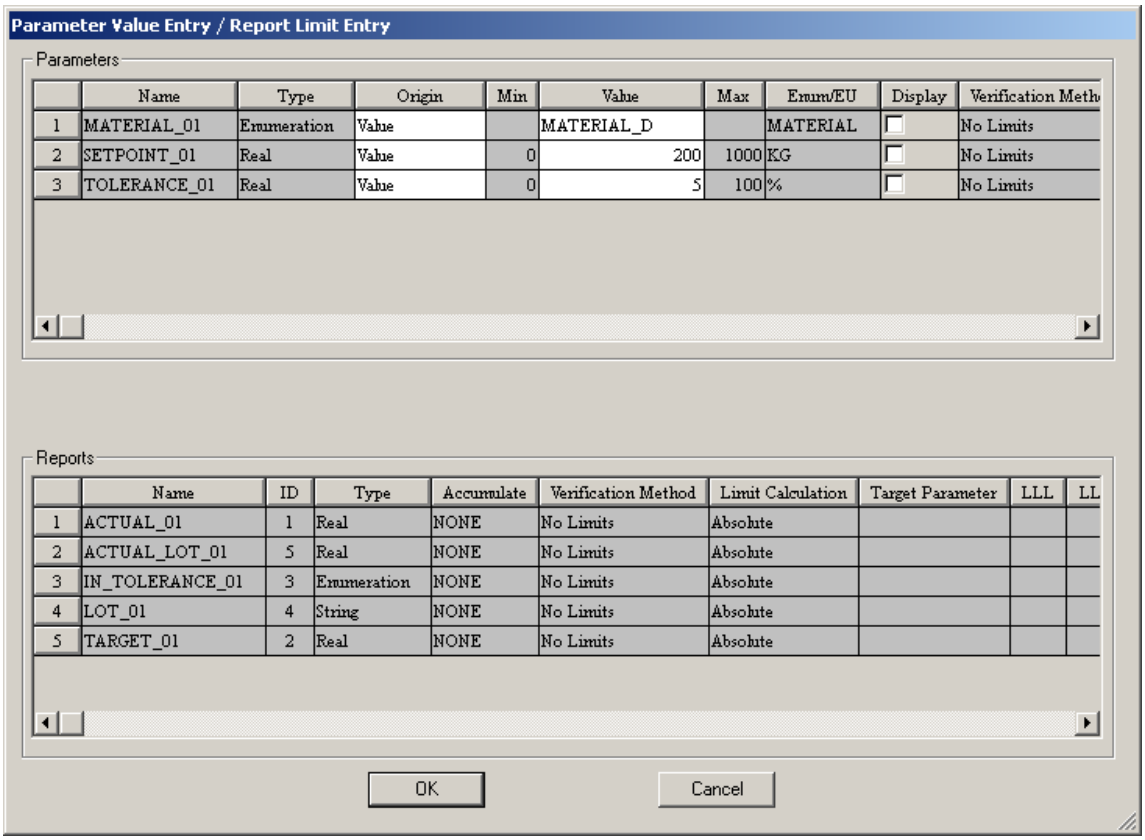
14. From the menu select ***Step → Parameter Values/Report Limits*** or from the toolbar, select the ***Value Entry***

button.



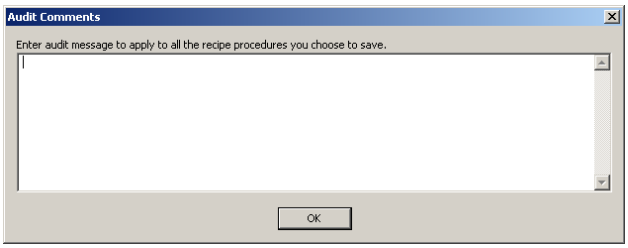
Lab 1: Factory Talk Batch "Basics"

15. The "Parameter Value Entry" screen will appear. ***Change*** the values per the screen below: MATERIAL_01 = ***MATERIAL_D,*** SETPOINT_01 = ***300,*** TOLERANCE_01 = ***5.*** Be sure to check the ***Display*** checkbox for SETPOINT_01. This configures which setpoint will show up in the SFC.



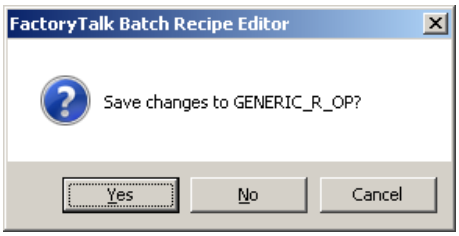
16. Select the ***OK*** button.

17. Save your work. From the menu, select ***File → Save All.***



Enter comments and select ***OK.***

Lab 1: Factory Talk Batch "Basics"



Select ***Yes***.

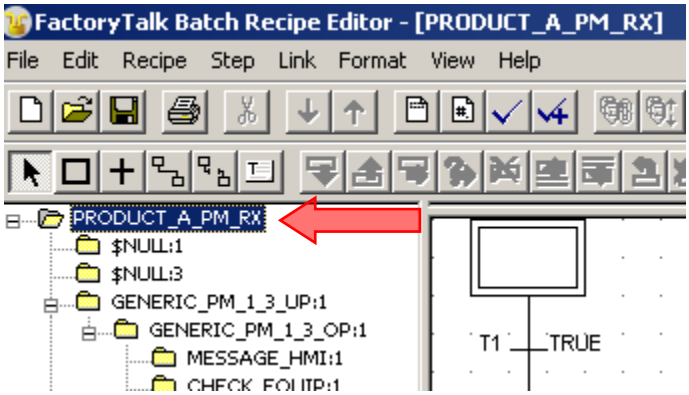
You have now completed the requested changes for production on the master recipe named, *PRODUCT_A_PM_RX*. The next time production selects this recipe, the agitator speed and ingredient addition sequence will be updated.

Lab 1: Factory Talk Batch "Basics"

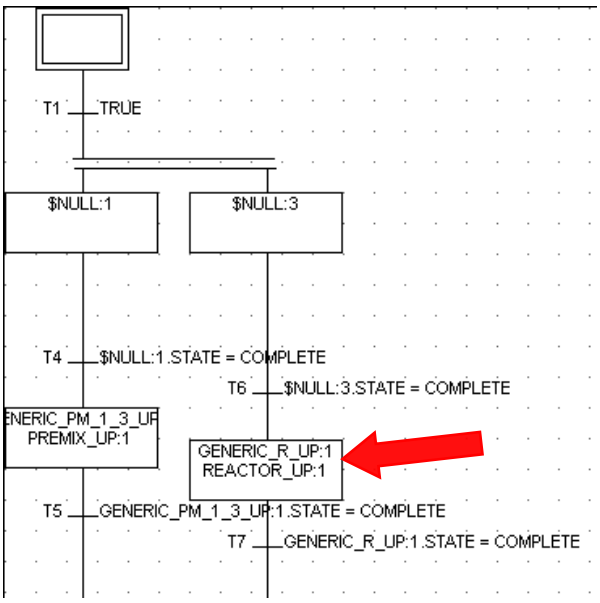
Optimize System with Smart Binding

Now let's make a new change for production: have the recipe select the warmest reactor at runtime of the two reactors .

1. Within the same "Product_A" recipe, select ***PRODUCT_A_PM_RX*** from the tree view on the left.

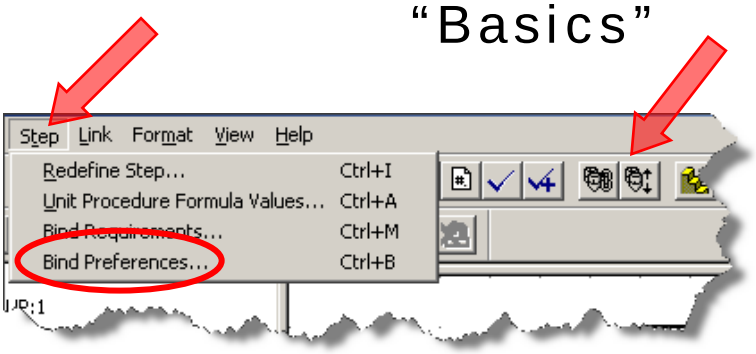


2. This will take you to the top level of the recipe. Select the ***GENERIC_R_UP:1*** step.

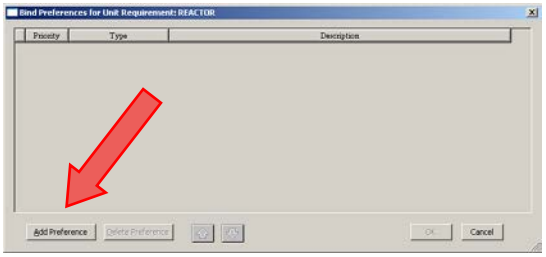


3. From the menu select ***Step → Bind Preferences*** or from the toolbar, select the ***Bind Preferences*** button.

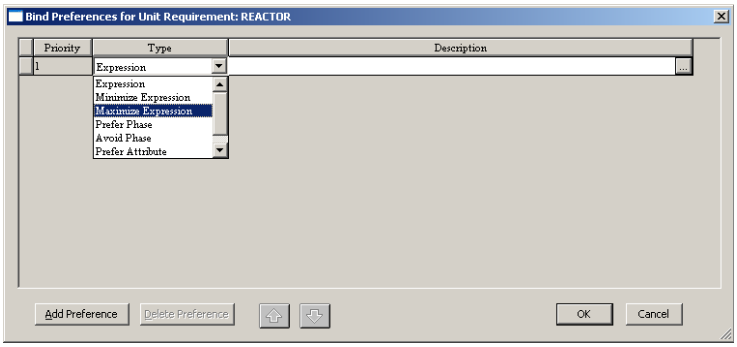
Lab 1: Factory Talk Batch "Basics"



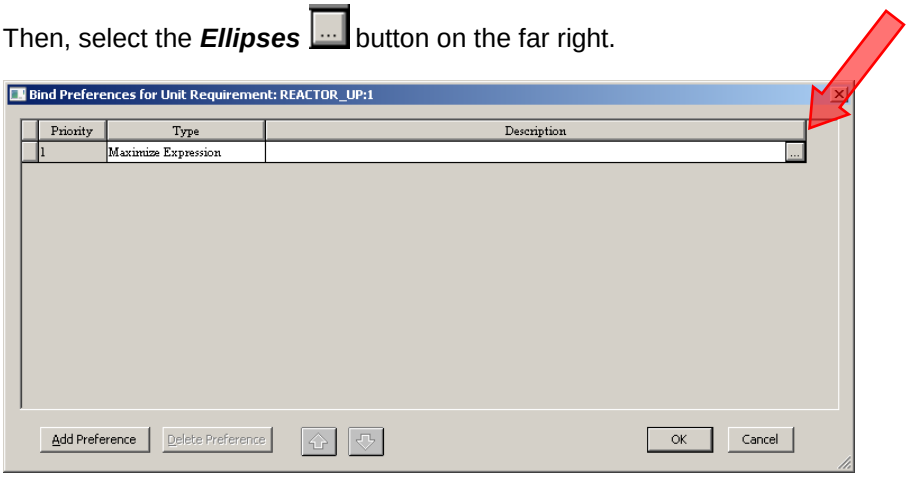
4. The "Bind Preferences" window will appear. Select the ***Add Preference*** Add Preference button.



5. A new "preference" will be added. From the dropdown for ***Type***, select the ***Maximize Expression***

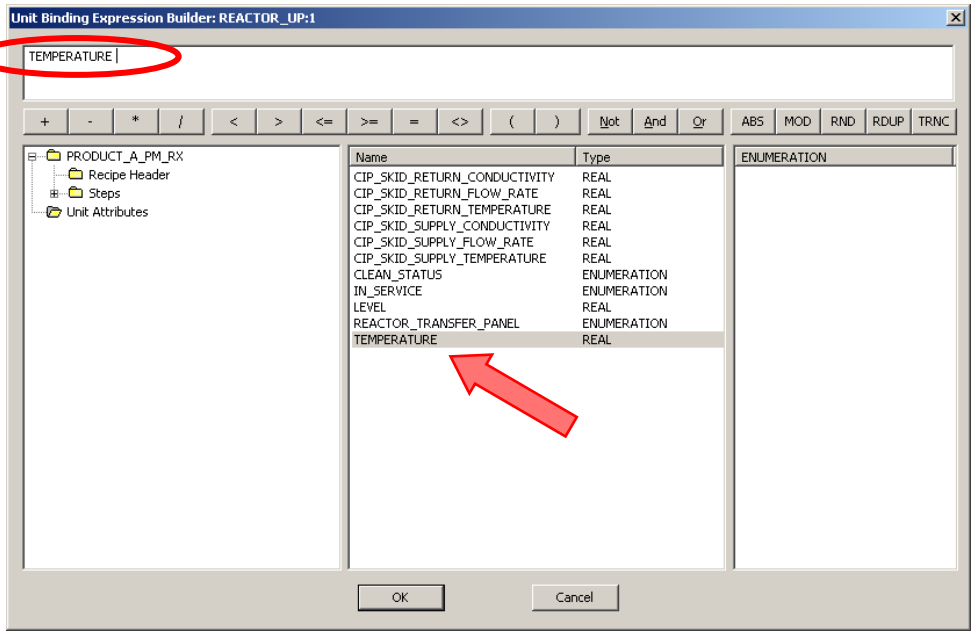


6. Then, select the ***Ellipses*** button on the far right.



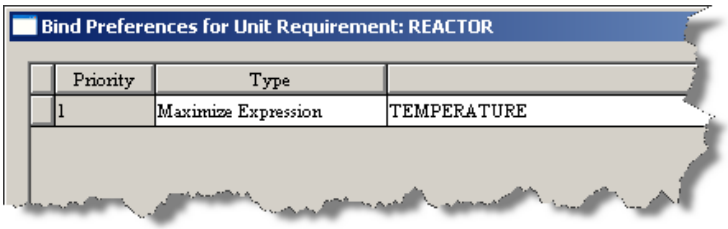
Lab 1: Factory Talk Batch "Basics"

7. The "Expression Builder" will appear. First select the ***Unit Attributes*** folder on the left. Next Double-click on the ***Temperature*** attribute. The Temperature tag will be added to the expression window.



8. Select the ***OK*** button.

9. You have now successfully added the maximize temperature configuration to the recipe.

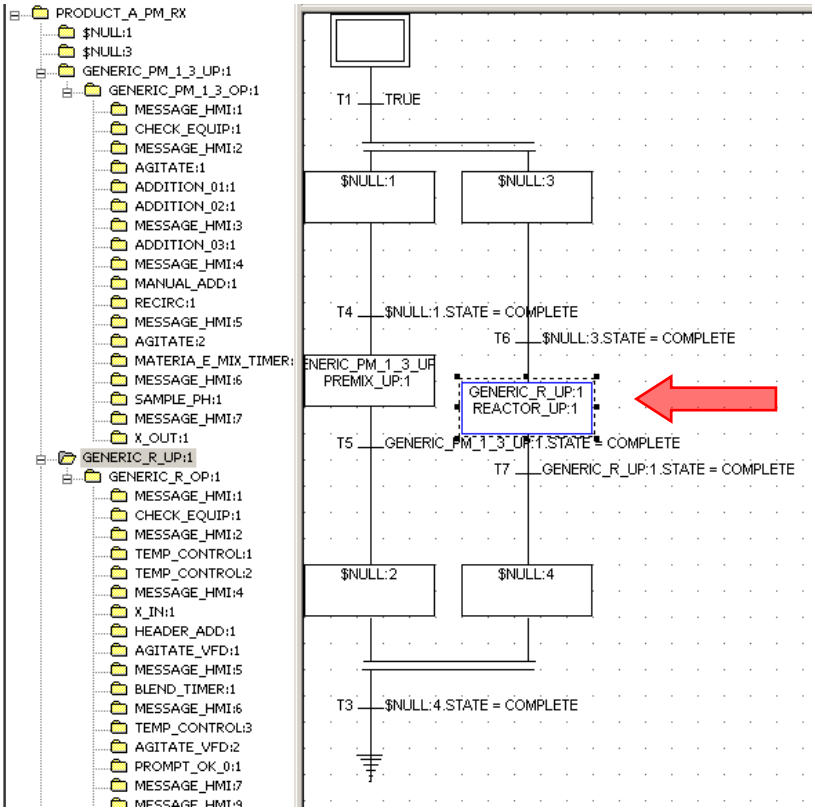


10. Select the ***OK*** button.

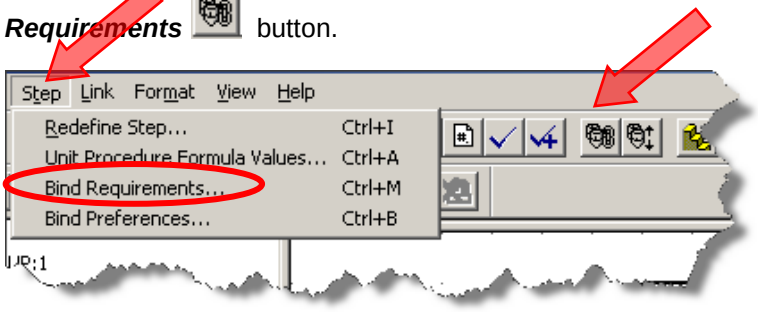
Lab 1: Factory Talk Batch "Basics"

Now let's make our change for maintenance: add the "in-service" requirement.

11. Again, select the ***GENERIC_R_UP:1*** step.



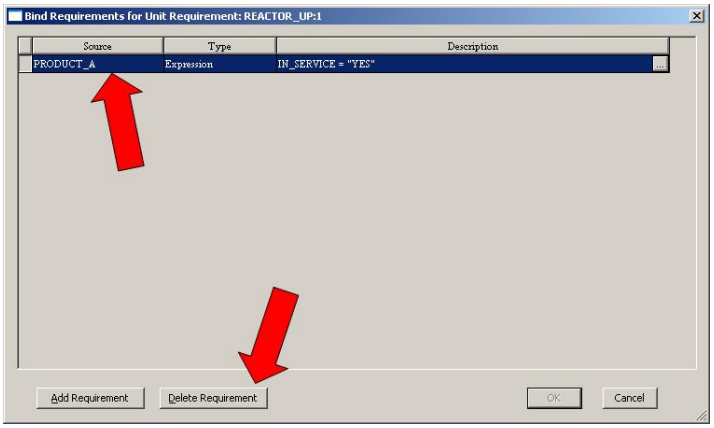
12. From the menu select ***Step → Bind Requirements*** or from the toolbar, select the ***Bind Requirements*** button.



Lab 1: Factory Talk Batch "Basics"

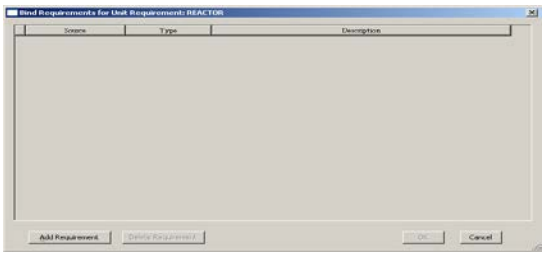
13. The "Bind Requirements" window appears with the completed requirement. To get experience with this feature, let's delete the current Bin Requirement then add the requirement. Select the requirement, then select the

button.



14. Now, select the ***Add Requirement***

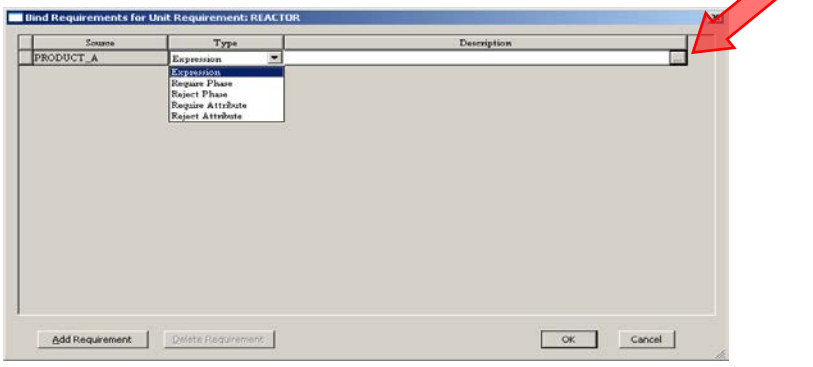
button.



15. A new "requirement" will be added. From the drop-down, select the ***Expression***

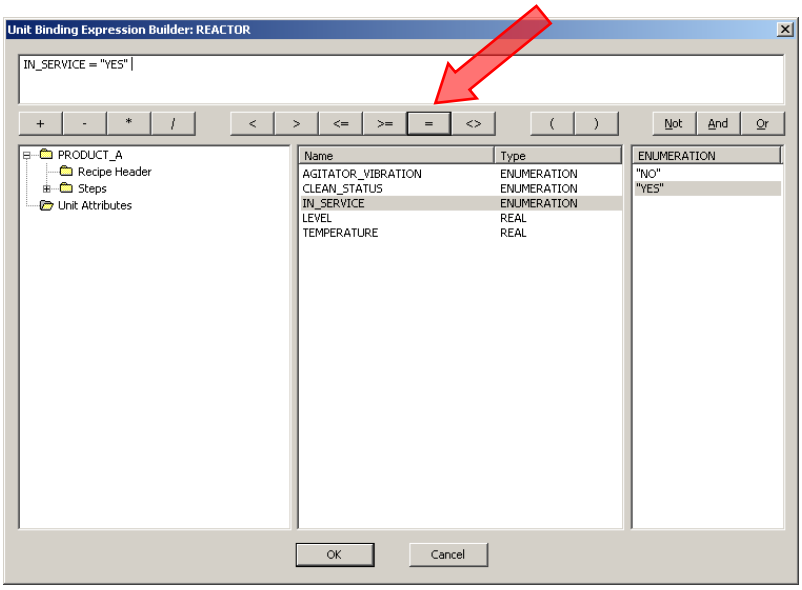
16. Then, select the ***Ellipses***

button on the far right.



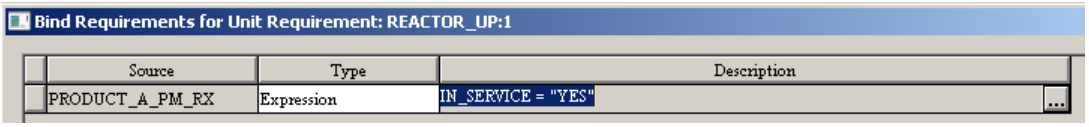
Lab 1: Factory Talk Batch "Basics"

17. The "Expression Builder" will appear. First select the ***Unit Attributes*** folder on the left with your mouse cursor. Next, double-click the ***IN_SERVICE*** attribute ***Name*** in the middle of the screen, then select the '***=***' operator, then double-click the ***Yes Enumeration*** value on the right. This creates the expression in the top window. An alternative is to just type the expression in by hand. **IN_SERVICE = "YES"**



18. Select the ***OK*** button.

19. You have now successfully added the "in-service" requirement to the recipe.



20. Select the ***OK*** button.

21. Save your work. From the menu, select ***File → Save All.*** Enter comments and select ***OK.***

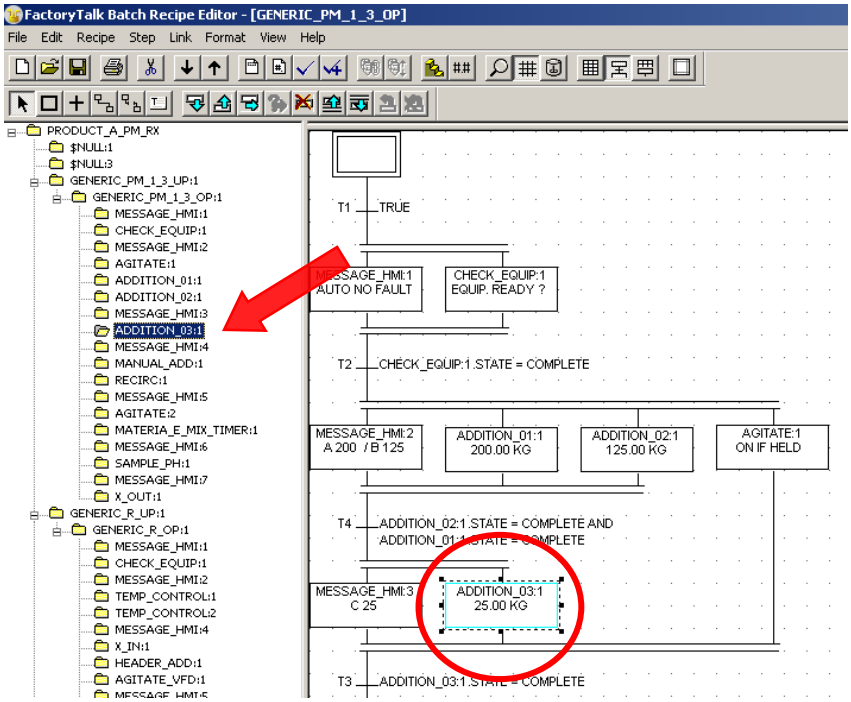
You have now completed the requested changes for production and maintenance. The next time production selects this recipe, the recipe will evaluate the preferences to pick the "warmest" reactor and the requirement to pick an "in-service" reactor

Lab 1: Factory Talk Batch "Basics"

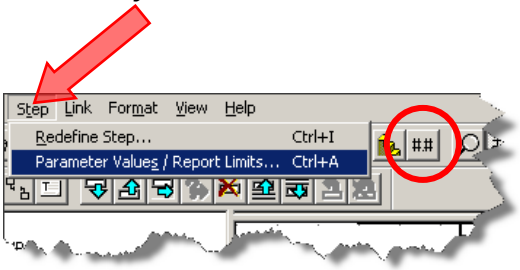
Applying a Parameter Expression

Now let's make another change for production: Production would like to reformulate Product A. They would like to base the setpoint amount of "Material C" as 17.5% of the actual amount of "Material A" added into the batch. We will leverage the FactoryTalk Batch Version 11 feature called "parameter expressions" in this step.

1. In the GENERIC_PM_1_3_OP:1 select the ***ADDITION_03:1*** phase to select it. The recipe editor will take you directly to the SFC step.

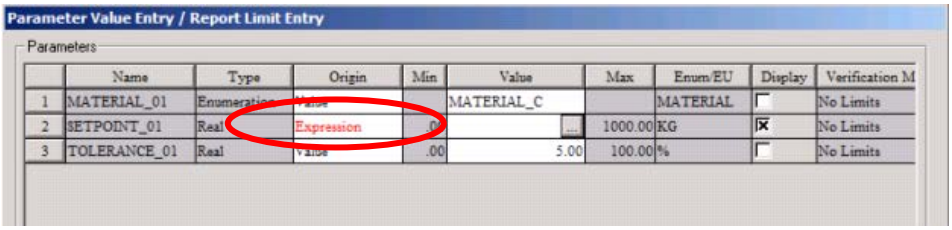


2. From the menu select ***Step → Parameter Values/Report Limits*** or from the toolbar, select the ***Value Entry*** ## button.

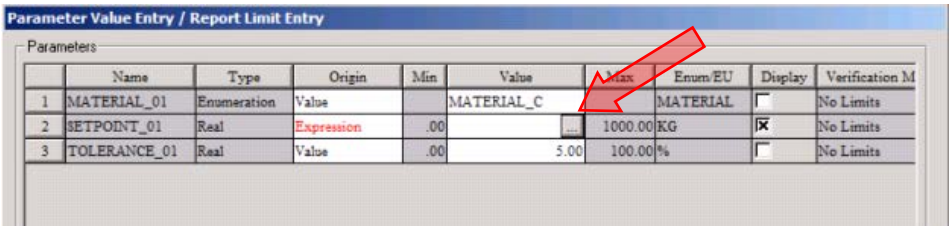


Lab 1: Factory Talk Batch "Basics"

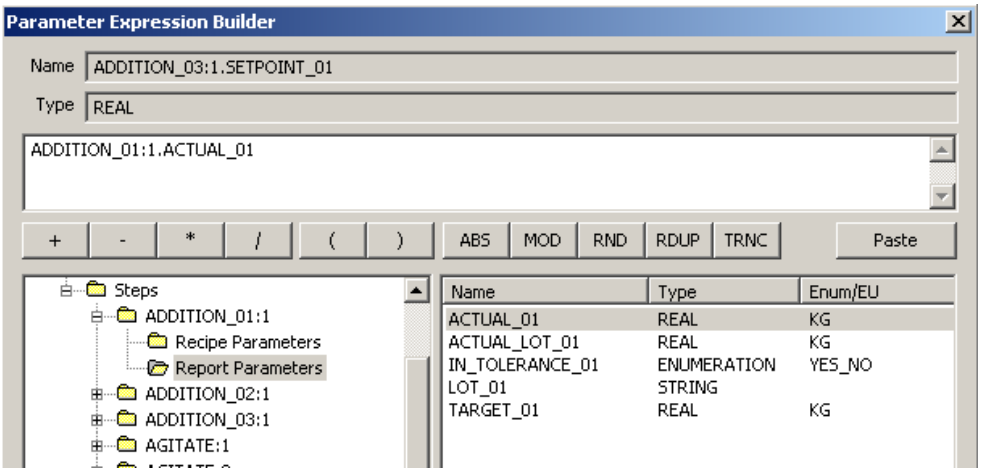
3. The "Parameter Value Entry" window will appear. Select the SETPOINT_01 parameter's Origin field to choose ***Expression***.

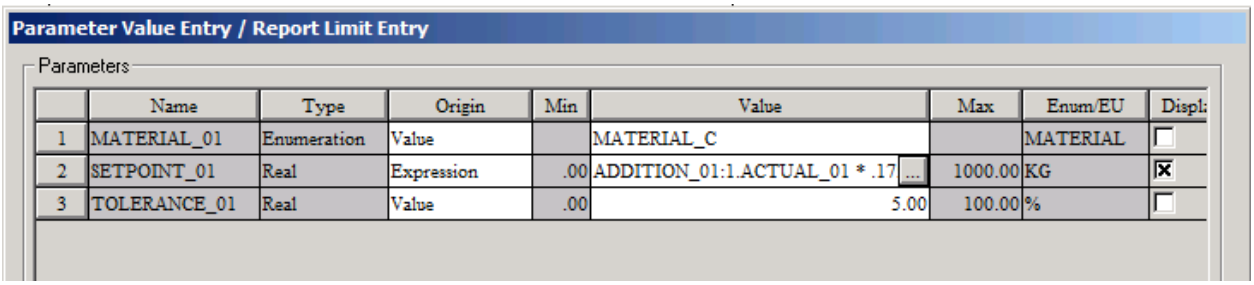


4. Select the ***Ellipses*** button under the **Value** column to enter your expression formula builder based upon a report value uploaded from the Addition_01 phase.

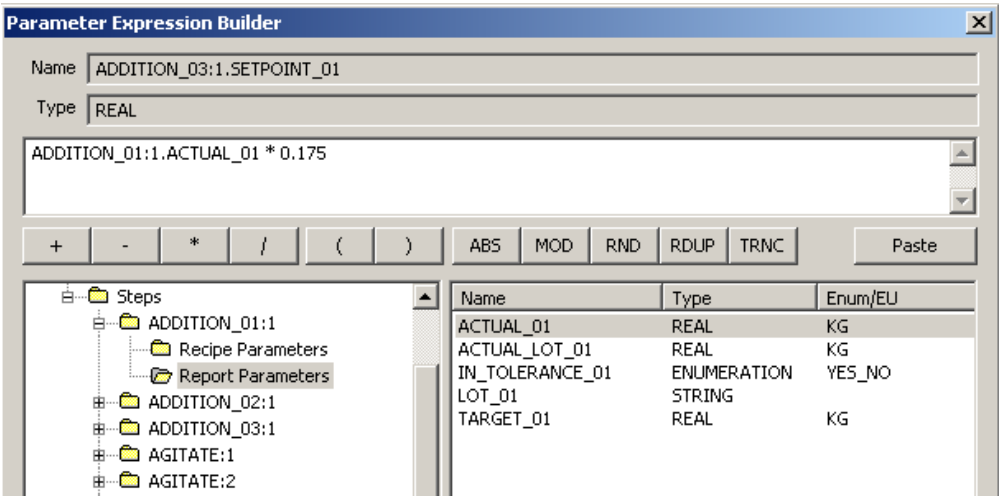


5. Enter the starting expression shown by first ***opening*** the ADDITION_01:1 ***folder***, then ***selecting*** the ***Report Parameters*** folder, and finally ***selecting*** the ***ACTUAL_01*** report of the ADDITION_01:1 phase.

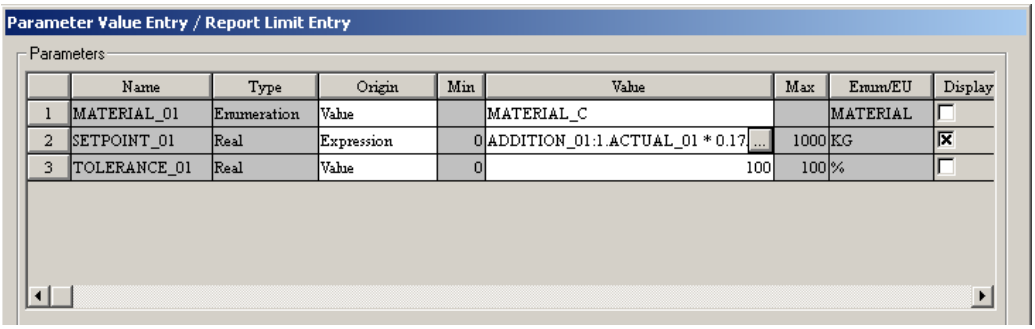




6. Now, ***select*** the ***multiplication operator **** so it goes next to the report parameter. Now, ***type in*** the numerical value to multiply by, ***0.175***.



7. Select ***OK***. This expression will now be displayed as the value for the ADDITION_03 phase for the SETPOINT_01 formula value..



You have modified the Product A formulation such that you changed the way in which the SETPOINT_01 parameter is determined based upon a previous phase's action and it's reported process value. This is a very powerful option.

Lab 1: Factory Talk Batch "Basics"

NOTE: It is important to note that no special HMI or controller code changes were required to make these recipe changes. The FactoryTalk Batch product leverages the concepts of ISA88 and separates the equipment from the recipe. Changes to the FactoryTalk Batch recipe are the only changes needed. This enables the "owner" of the product to maintain and update the recipes as needed.

The R&D's (Recipe Author) Perspective is now complete!

If you choose, you can re-run the modified recipe by following the Operator's perspective and selecting the "Product_A" recipe. But due to lab time constraints, we will move to the next section.

Lab 1: Factory Talk Batch "Basics"

Plant Management's Perspective - Batch Reporting

In the role of Plant management, you need a clear view of batch production at a high level, but may still want the ability to access details when needed. This user perspective demonstrates the capabilities of web-based batch reporting. Use your Internet Explorer web browser to run production queries, view exception reports, and compare batch cycles. Find and view your data of interest on-line, then export locally for further analysis or print out a hard copy for your files.

Web-Based Reporting - Electronic Batch Records

FactoryTalk Batch maintains an electronic batch record of all the events that happen as the batch runs. The electronic batch record is stored as a flat ASCII file on the Batch Server. This file can be *encrypted* with an electronic key record that can tell you if it has ever been modified after it was written by the Batch Server. This ASCII text file can be archived into an ODBC database as well. There is a web-based reporting application that will move the journals into SQL Server 2008 and use Microsoft Reporting Services (SSRS) to extract data out of the journal for various production reports. SSRS provides the tools for building templates that can retrieve, analyze, and report batch data. The following reports have been developed for your use without programming. You can customize these reports to fit your own needs if required.

010 – Batch Listing

- Provides a list of batches that meet a user's search or query criteria

020 – Batch Summary

- Offers batch specific summary information on batch data (step time) and setpoint vs. actual[1]

030 – Batch Detail

- Offers batch specific detailed information on batch data (step times, parameters, reports), abnormal state changes, batch failures, FactoryTalk alarms & events, setpoint vs. actual[1], and out of tolerance values.

040 – Material Usage[1]

- Offers material specific consumption information including: batch that consumed it, quantity & lot consumed, total consumption over period of search.

050 – Forward Tracking[1]

- Enables you to find all batches that consumed a material lot or used a piece of equipment.

060 – Backward Tracing[1]

- Enables you to trace all ingredients consumed and equipment used by a specific batch.

070 – Batch Execution

- Review a specific batch's step execution times in a bar chart format.

080 – Duration Comparison

- Compare the durations of multiple batches in a bar chart format.

090 – Batch Exceptions

- Review all batches with exceptions. Includes abnormal state changes, FactoryTalk alarms & events, batch failures, out of tolerance values[1]

Lab 1: Factory Talk Batch "Basics"

1 - *Requires use of specific naming conventions during design of the FactoryTalk Batch area model. This naming convention can be found in the user manual for the reporting application*.

Lab 1: Factory Talk Batch "Basics"

View Batch Reports

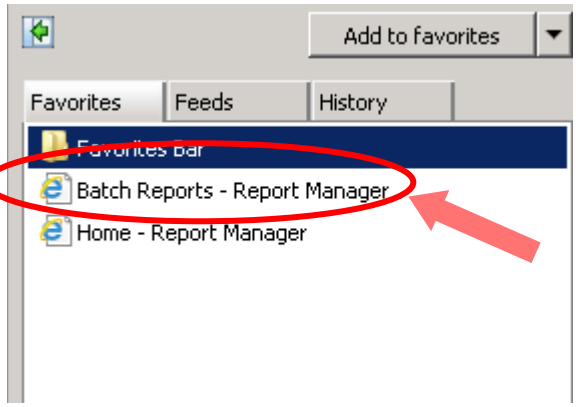
1. The Batch Reports are viewed using Internet Explorer, both ***AppSerBatch*** and ***PASS01 VMWare images*** can be used to view the reports. The reports can also, be viewed in the HMI by selecting the ***Batch Report*** button

from the Batch navigation bar. This brings up a display with a Microsoft Webbrowser control pointed to the reporting service URL. The examples below use Internet Explorer.

2. From the Windows taskbar, select ***Internet Explorer***.

   The eProcedure client interface will launch in Internet Explorer as the default on the ***AppSerBatch*** VMware image.

3. At the far upper right corner of Internet Explorer, select the ***Favorites*** menu , select ***Batch Reports - Report Manager***.

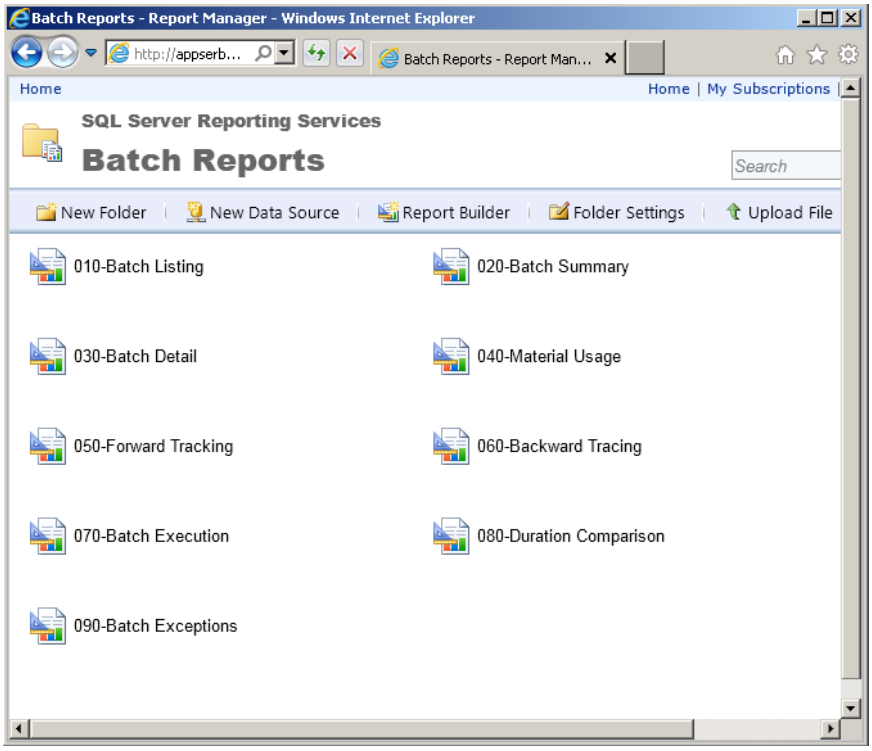


NOTE: It may take a couple of minutes to get all the services loaded and running.

The URL for the batch reports is http://AppSerBatch/Reports/.

Lab 1: Factory Talk Batch "Basics"

4. The home screen will load. From this page, all pre-defined reports are available

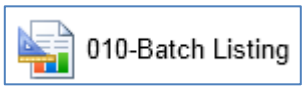


NOTE: At any time, you can return to the last screen using the web browser back button. You can also navigate through the folder path from the header of the report. (Home>Batch Reports)

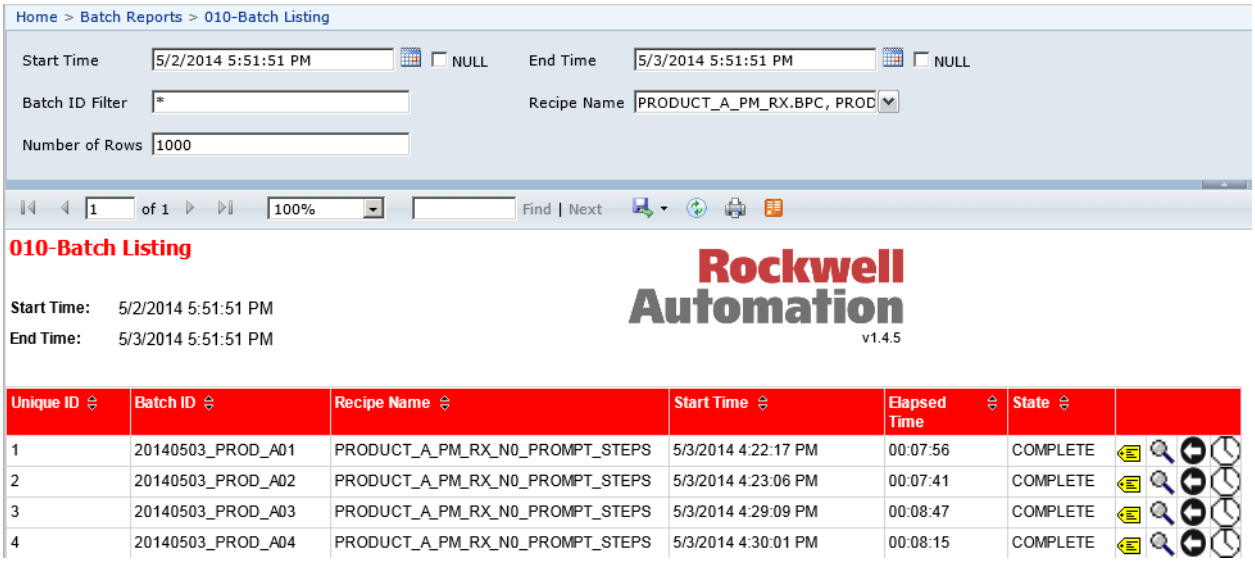
Lab 1: Factory Talk Batch "Basics"

Report Query Header

Let's first get familiar with the query capability of the report system. Each report uses this similar query method at the top of the report

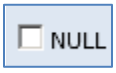
1. Select ***010-BatchListing*** 

2. The report will open with the following query header.

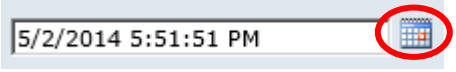


3. **Start Time/End Time –**

The reporting system first filters all searches based on time. All sub-filter lists (Batch ID, Recipe Name, Process Cell, & Unit Name) are trimmed based on the user selection of time. You should consider "time" to be the master search criteria.

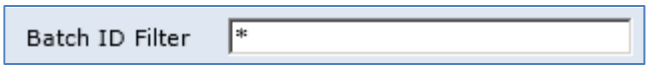
- 

"Null" selections are available for both start and end time. These can be used to search from the beginning of time (start time null) or to most recent time (end time null).

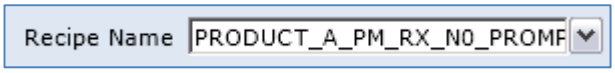
- 

Standard Microsoft Reporting Services Date/Time syntax is used. Selecting the ***Calendar*** icon allows you to search in more detail or simply type date and/or time into the box. The minimum data required is the date.

Lab 1: Factory Talk Batch "Basics"

4. **Batch ID Filter –** 

The "Batch ID" is the user defined name given to a batch at runtime. This filter allows the user to trim the query list to those matching the specified text. Expand your filter capability through use of the asterisk (*) wildcard at any point in the filter.

5. **Recipe Name –** 

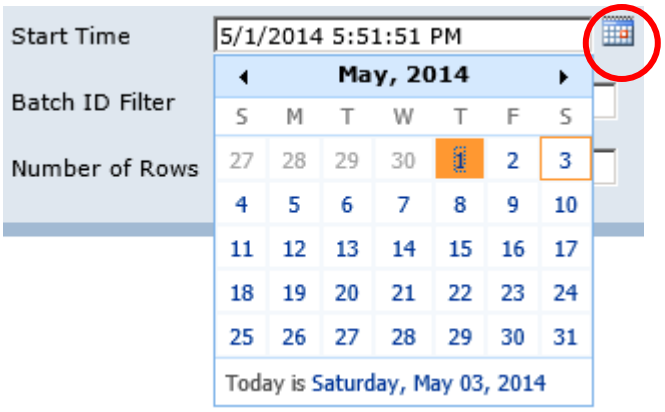
The "Recipe Name" is the name to which the batch recipe is saved. The Recipe Name dropdown list is populated in real-time by listing all recipe names run during the user specified time frame. By default, all items in this drop down are selected. Any individual line items can be selected/un-selected by checking/un-checking the box next to the name. Alternatively, the user can select all/un-select all by checking/un-checking the "select all" check box.

Lab 1: Factory Talk Batch "Basics"

Batch Listing Report

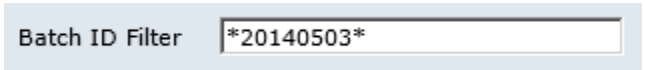
Now that we are familiar with the query header, let's perform our first batch list search. As Plant Manager, I am interested in reviewing a specific production run for a new product recently introduced at the plant in the month of May 2014. The specific Batch ID identifier was "*20140503*". Let's take a look!

1. From the query header, select ***Start Time Calendar,*** and select ***May 1, 2014.*** (Alternatively, you could just type 5/1/2014 into the entry field and hit the Enter key.)



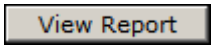
2. From the query header, select ***End Time Calendar***, and select ***May 4, 2014.*** (Alternatively, you could just type 5/4/2014 into the entry field and hit the Enter key.)

3. From the query header, enter ***** *20130430**** into the "Batch ID Filter" *(Be sure to use the asterisk (*) wildcard both before and after the entry. This ensures we get the full production run)*

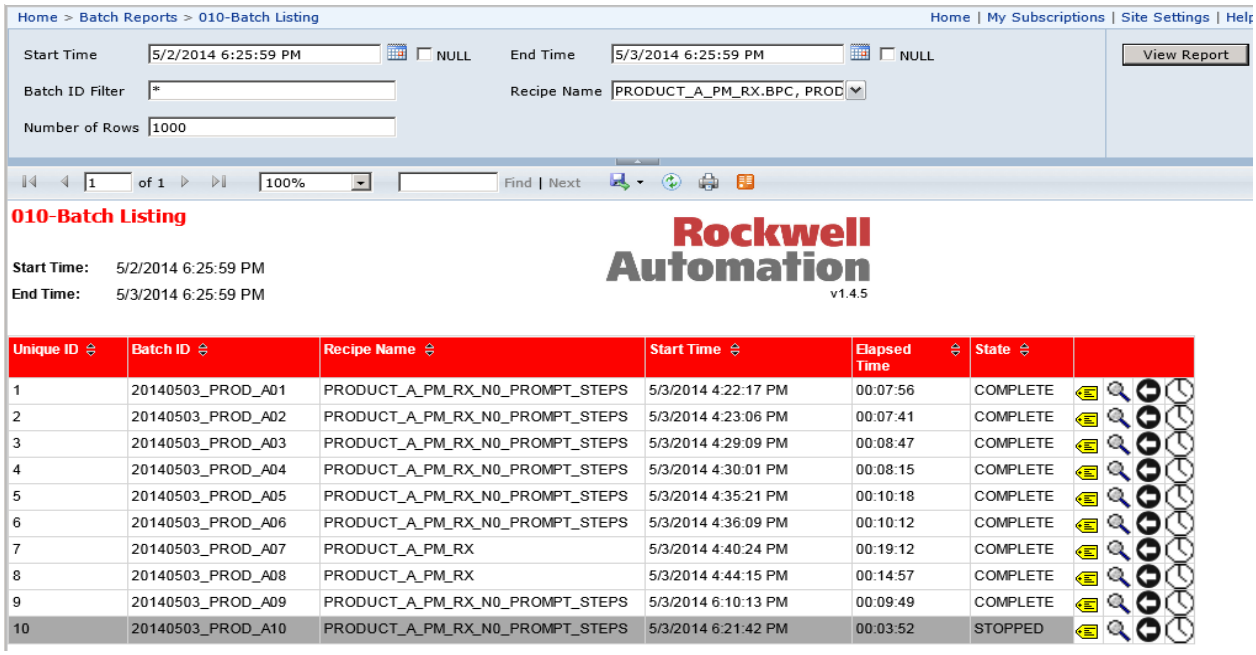


NOTE: As you select dates and complete the Batch ID Filter, the remaining dropdowns are updated to reflect your search criteria.

Lab 1: Factory Talk Batch "Basics"

4. From the top right side of the report, select ***View Report*** 

5. A listing of 10 batches will appear. This shows the full production run of this new "Product A" run on May 3, 2014.



Unique ID	Batch ID	Recipe Name	Start Time	Elapsed Time	State
1	20140503_PROD_A01	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:22:17 PM	00:07:56	COMPLETE
2	20140503_PROD_A02	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:23:06 PM	00:07:41	COMPLETE
3	20140503_PROD_A03	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:29:09 PM	00:08:47	COMPLETE
4	20140503_PROD_A04	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:30:01 PM	00:08:15	COMPLETE
5	20140503_PROD_A05	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:35:21 PM	00:10:18	COMPLETE
6	20140503_PROD_A06	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 4:36:09 PM	00:10:12	COMPLETE
7	20140503_PROD_A07	PRODUCT_A_PM_RX	5/3/2014 4:40:24 PM	00:19:12	COMPLETE
8	20140503_PROD_A08	PRODUCT_A_PM_RX	5/3/2014 4:44:15 PM	00:14:57	COMPLETE
9	20140503_PROD_A09	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 6:10:13 PM	00:09:49	COMPLETE
10	20140503_PROD_A10	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	5/3/2014 6:21:42 PM	00:03:52	STOPPED

NOTE: From this view, we can see that the first nine batches completed normally, but someone "Stopped" the tenth batch after 3 mins 52 sec (elapsed time column). Production noted that batches took a varying amount of time to complete, why? Let's take a closer look.

6. Notice that for each line item, a set of four "hotlink" icons are shown. These enable quick navigation to other reports that keep you in context of the specific "Unique ID" (unique identifier for each batch.) on that line. We will use these links later in this lab.

- **Batch Summary Report**

- **Batch Detail Report**

- **Backward Tracing Report**

- **Batch Execution Report**

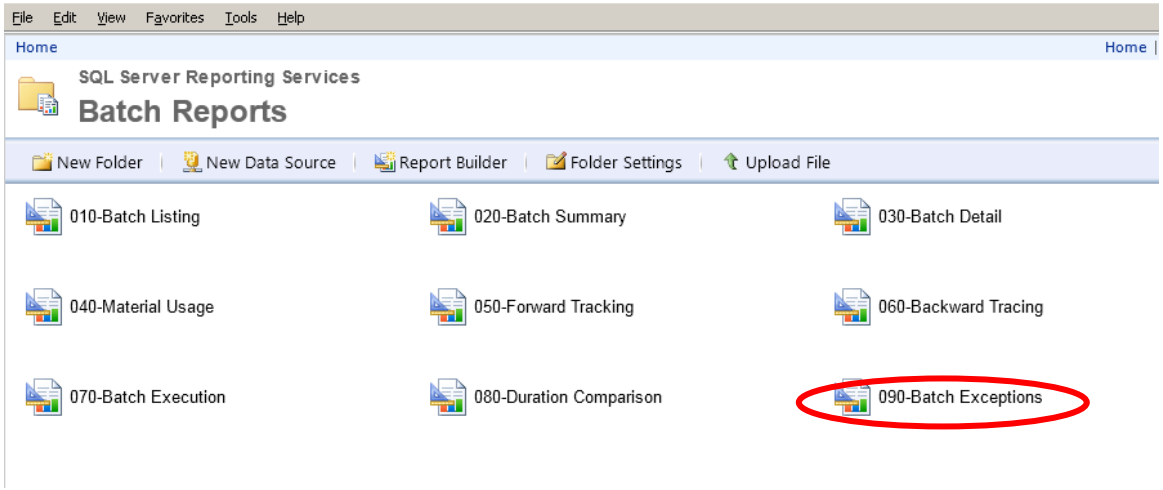
Lab 1: Factory Talk Batch "Basics"

Batch Exception Report

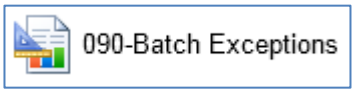
As Plant Manager, I may also be interested in reviewing all batch exceptions for a specific production run for a new product recently introduced at the plant in the month of May, 2014. Again we will use the specific Batch ID identifier "*20140503*". Let's take a look!

1. From the top of the report, click on ***Batch Reports***.

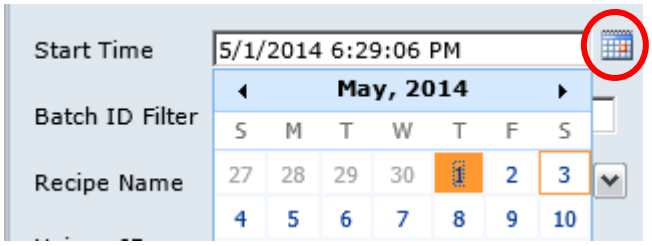
2. This will return us to the main window that lists all available reports.



3. Select ***090-Batch Exceptions***

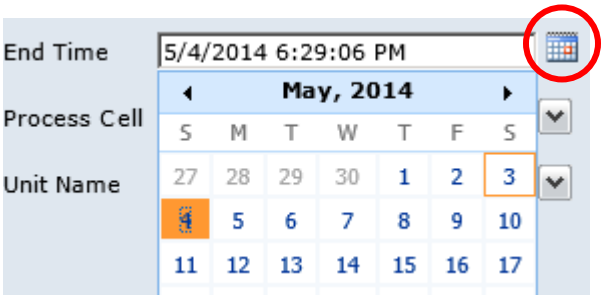


4. From the query header, select ***Start Time Calendar,*** and select ***May 1, 2014***. (Alternatively, you could just type 5/1/2014 into the entry field.)

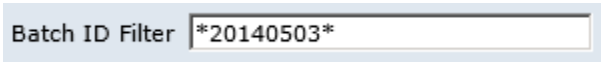


5. From the query header, select ***End Time Calendar***, and select ***May 4, 2014***. (Alternatively, you could just type 5/4/2014 into the entry field.)

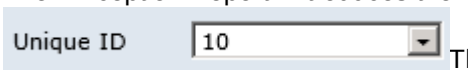
Lab 1: Factory Talk Batch "Basics"



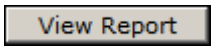
6. From the query header, enter ***20140503**** into the "Batch ID Filter" and hit the ***Enter*** key *(Be sure to use the asterisk (*) wildcard both before and after the entry. This ensures we get the full production run)*



7. The "Exception Report" introduces the new filter criteria "Unique ID".



The "Unique ID" filter will update based on all other query boxes above it. This allows the user to further refine their exception search to a minimum set of unique batches if desired. Select "Unique ID **"10".**

8. From the top right side of the report, select ***View Report*** 

9. The "Batch Exception" report displays all batches in range with

   a. Abnormal State Changes – These states include Held, Stopped, Aborted, and/or Paused.

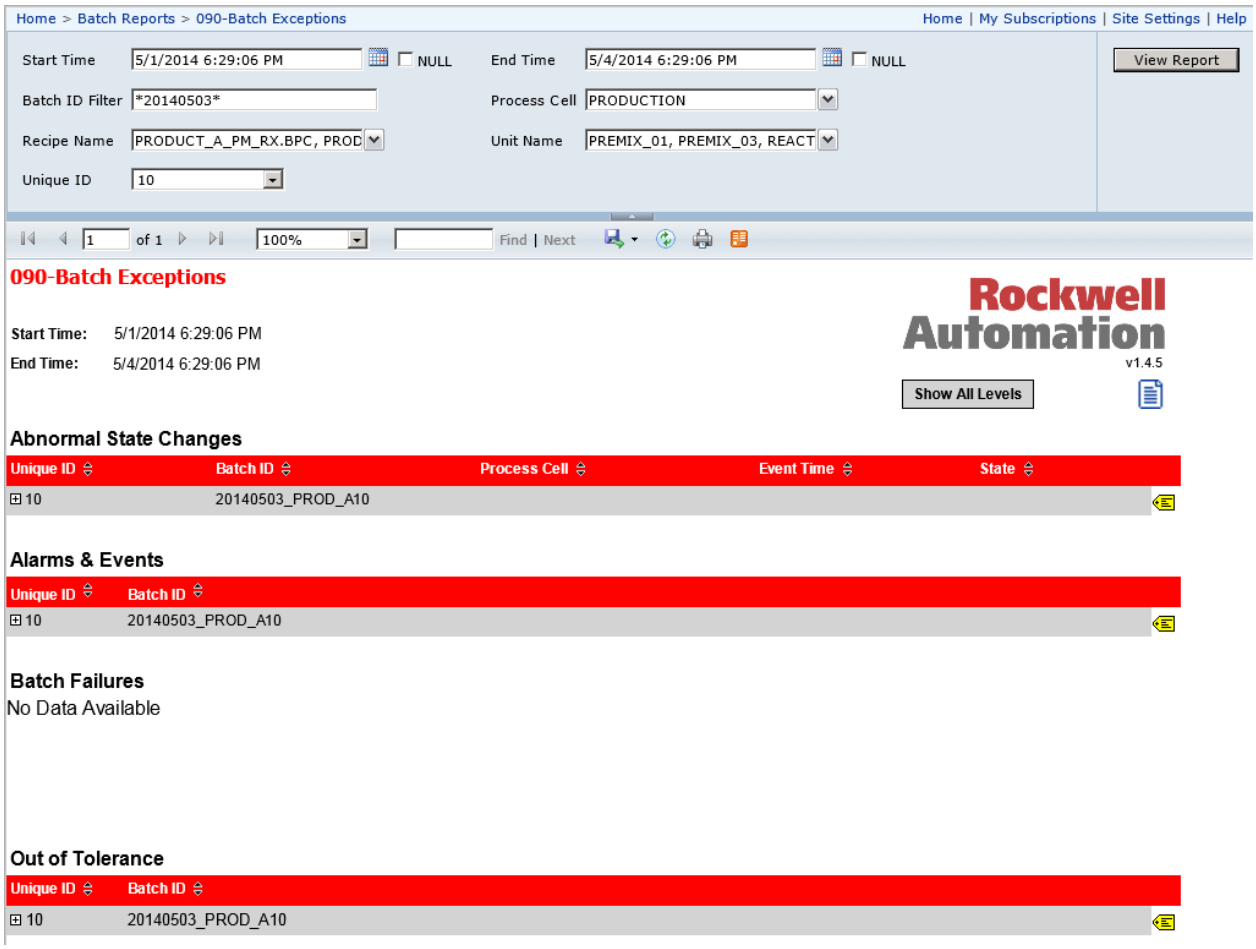
   b. Alarms & Events – The web based reports can be linked to the standard FactoryTalk Alarms & Events database table in SQL server. The FTAE "Alarm Class" field of the report is used to associate a specific alarm/event with a batch unit name. Simply add the batch unit name to this alarm/event field and all alarms/events triggered during the batch unit execution will be reported.

   c. Batch Failures – Includes all FactoryTalk Batch configured alarms.

   d. Out Of Tolerance – Includes a list of all Setpoint vs. Actual comparisons identified as out of tolerance. The "out-of-tolerance" flag is a report register set by the control system during execution of the phase based on coded conditions, not batch server interpretation. This ensures maximum flexibility in determining the out-of-tolerance state.

Lab 1: Factory Talk Batch "Basics"

10. The Batch Exception report will appear.



NOTE: From this view, we can see each of the four sections defined above. Each section can contain multiple lines. Each line represents a unique batch. The wording "No Data Available" will be shown when no batches meet the search criteria.

Lab 1: Factory Talk Batch "Basics"

11. Select the ***Expansion*** box next to ***Unique ID = 10*** in the "***Abnormal State Change***" table. Here we can see that the batch was stopped. Select the ***Collapse*** box to collapse the row.

Abnormal State Changes

Unique ID	Batch ID	Process Cell	Event Time	State
⊟ 10	20140503_PROD_A10			
		PRODUCTION	5/3/2014 6:25:34 PM	STOPPED
		PRODUCTION	5/3/2014 6:25:34 PM	STOPPED

12. Select the ***Expansion*** box next to ***Unique ID = 10*** in the "***Alarms & Event***" table. We see that two over tolerance alarms were logged in the FactoryTalk Alarms & Event database. Select the ***Collapse*** box to collapse the row.

Alarms & Events

Unique ID	Batch ID
⊟ 10	20140503_PROD_A10

Source Name	Message	Cond	Unit Name	Input Value	Limit Value
CPG_Premix_01_FQ101_Alm_OverTol	Raw Material 1 Dosing Station Totalizer Over Tolerance Error Alarm	TRIP	CPG_Premix_01	1	0
CPG_Premix_01_FQ103_Alm_OverTol	Raw Material 3 Dosing Station Totalizer Over Tolerance Error Alarm	TRIP	CPG_Premix_01	1	0

13. There are no "***Batch Failures***" for this batch

14. Select the ***Expansion*** box next to ***Unique ID = 10*** in the "***Out Of Tolerance***" table. Here we can see that "Addition_01:1-1" and "Addition_03:1-1" over delivered by 5.179 Kg and 3.329 Kg. Select the ***Collapse*** box to collapse the row.

Out of Tolerance

Unique ID	Batch ID
⊟ 10	20140503_PROD_A10

Recipe	Label	Setpoint	Target	Actual	Deviation
10:PRODUCT_A_PM_RX_N0_PROMPT_STEPS\GENERIC_NO_PROMPT_PM_1_3_UP:1 \GENERIC_NO_PROMPT_PM_1_3_OP:1\ADDITION_01:1-1	SETPOINT_01	200.000	200.000	205.179	5.179
10:PRODUCT_A_PM_RX_N0_PROMPT_STEPS\GENERIC_NO_PROMPT_PM_1_3_UP:1 \GENERIC_NO_PROMPT_PM_1_3_OP:1\ADDITION_03:1-1	SETPOINT_01	25.000	25.000	28.329	3.329

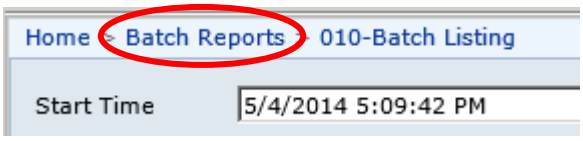
NOTE: This report offers a good overview of exceptions in the system.

Lab 1: Factory Talk Batch "Basics"

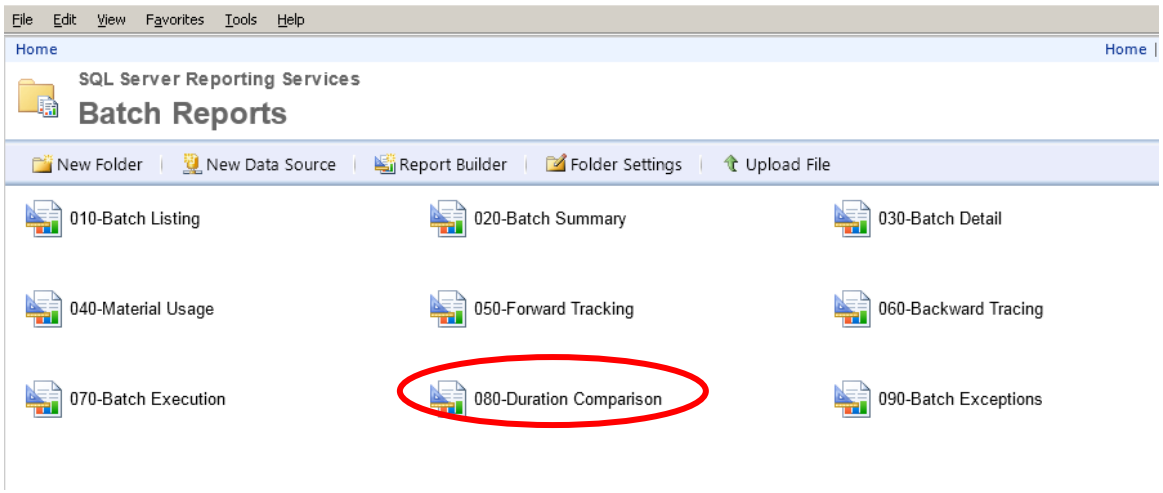
Batch Duration Comparison Report

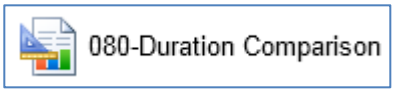
As Plant Manager, I may also be interested in comparing the duration of all batches for a specific production run of the new product recently introduced at the plant in the month of May 2014. Again we will use the specific Batch ID identifier "*20140503*". Let's take a look!

1. From the top of the report, click on ***Batch Reports***.

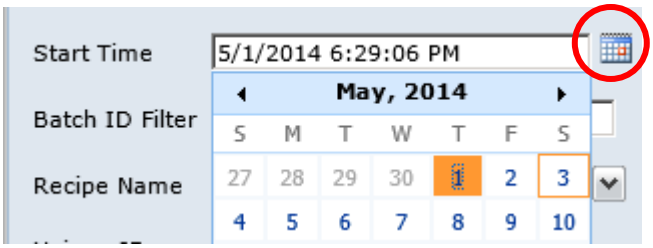


2. This will return us to the main window that lists all available reports.



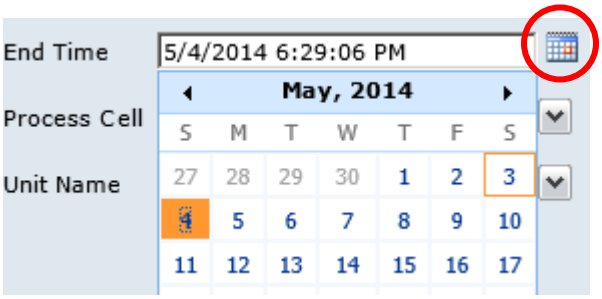
3. Select ***080-Duration Comparison*** 

4. From the query header, select ***Start Time Calendar,*** and select ***May 1, 2014***. (Alternatively, you could just type 5/1/2014 into the entry field.)

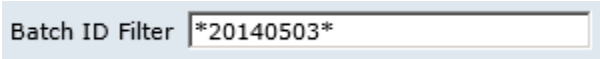


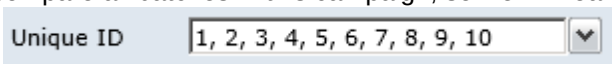
5. From the query header, select ***End Time Calendar***, and select ***May 4, 2014***. (Alternatively, you could just type 5/4/2014 into the entry field.)

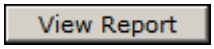
Lab 1: Factory Talk Batch "Basics"



6. From the query header, enter ***20140503**** into the "Batch ID Filter" and hit the ***Enter*** key *(Be sure to use the asterisk (*) wildcard both before and after the entry. This ensures we get the full production run)*

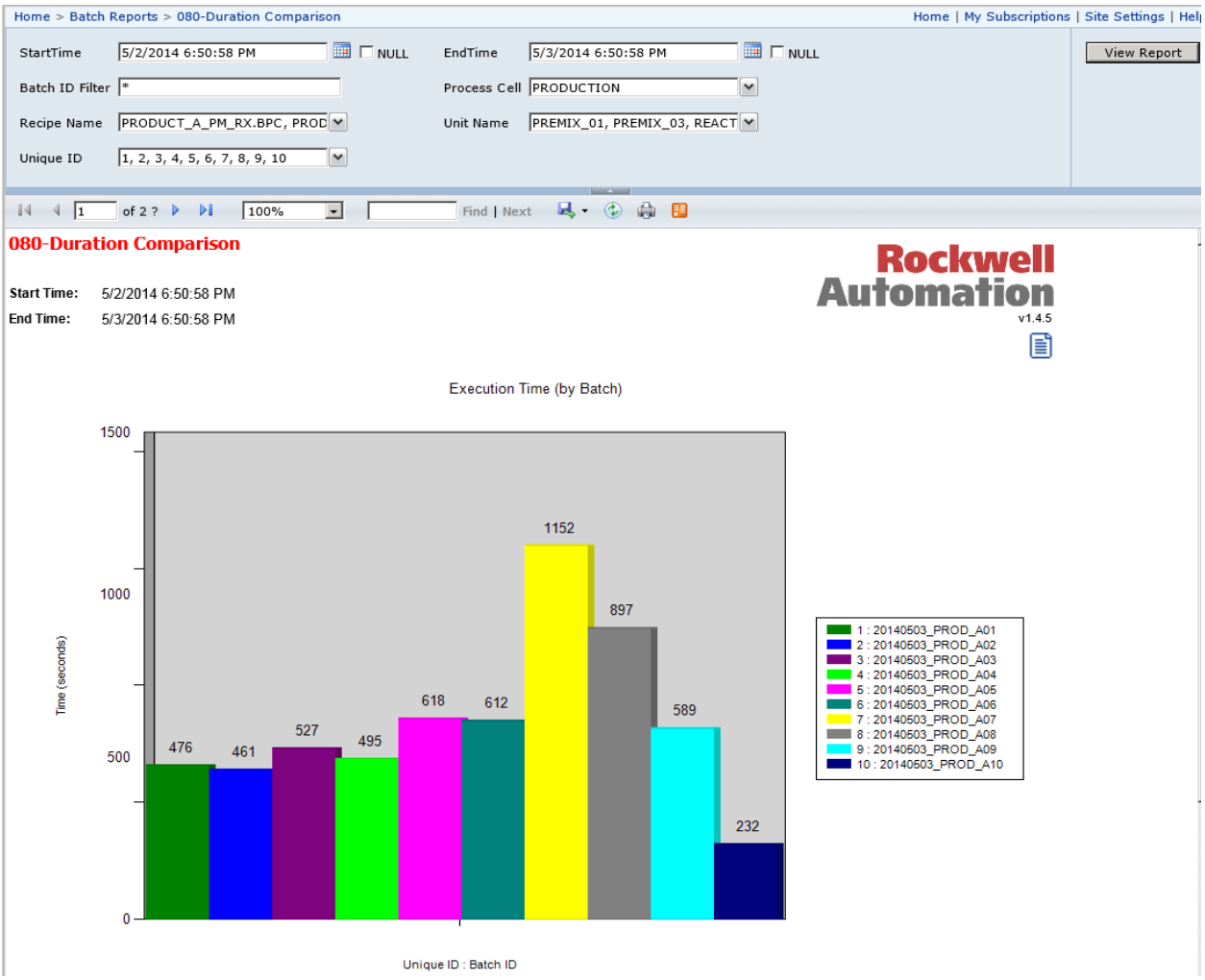


7. We want to compare all batches in this campaign, so we will leave all batches checked under the "Unique ID". 

8. From the top right side of the report, select ***View Report*** 

Lab 1: Factory Talk Batch "Basics"

9. The "Duration Comparison" report displays all batches in range.



View Details

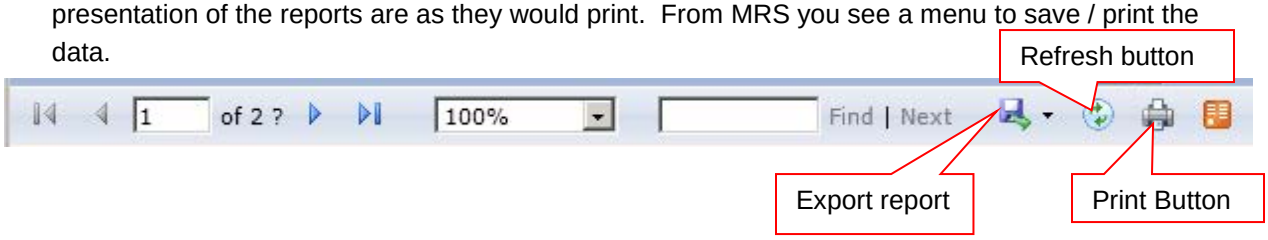
Unique ID	Batch ID	Start Time	End Time	Duration HH:MM:SS	Duration Total Sec
1	20140503_PROD_A01	5/3/2014 4:22:17 PM	5/3/2014 4:30:13 PM	00:07:56	476
2	20140503_PROD_A02	5/3/2014 4:23:06 PM	5/3/2014 4:30:47 PM	00:07:41	461
3	20140503_PROD_A03	5/3/2014 4:29:09 PM	5/3/2014 4:37:56 PM	00:08:47	527
4	20140503_PROD_A04	5/3/2014 4:30:01 PM	5/3/2014 4:38:16 PM	00:08:15	495
5	20140503_PROD_A05	5/3/2014 4:35:21 PM	5/3/2014 4:45:39 PM	00:10:18	618
6	20140503_PROD_A06	5/3/2014 4:36:09 PM	5/3/2014 4:46:21 PM	00:10:12	612
7	20140503_PROD_A07	5/3/2014 4:40:24 PM	5/3/2014 4:59:36 PM	00:19:12	1152
8	20140503_PROD_A08	5/3/2014 4:44:15 PM	5/3/2014 4:59:12 PM	00:14:57	897
9	20140503_PROD_A09	5/3/2014 6:10:13 PM	5/3/2014 6:20:02 PM	00:09:49	589
10	20140503_PROD_A10	5/3/2014 6:21:42 PM	5/3/2014 6:25:34 PM	00:03:52	232

NOTE: From this view, we can see both a bar chart view of batch duration as well as a table of raw data

Lab 1: Factory Talk Batch "Basics"

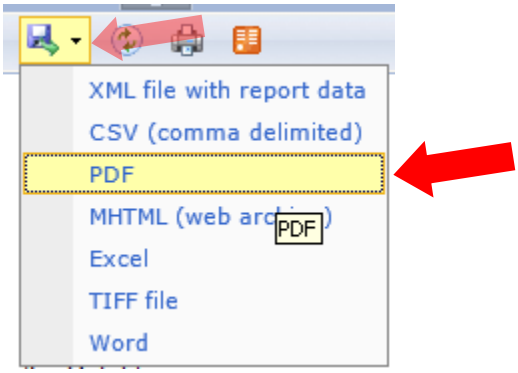
Saving and Printing Data

1. Microsoft Reporting Services (MRS) follows a standard WYSIWYG format. The layout and presentation of the reports are as they would print. From MRS you see a menu to save / print the data.



2. The ***print*** button would print the report to a printer using the standard print dialog box.

3. Let's save / export the report. From the Export box, select the ***Acrobat (PDF) file***.



4. Click on the ***PDF Export link***.

5. For the prompt to Open, Save, or Cancel at the bottom of the screen; Select ***Open.***

6. The report is now presented in Adobe Acrobat Reader. You could save and send the report to someone else for follow up. ***Close the acrobat window***.

The Plant Management's Perspective is now complete!

Lab 1: Factory Talk Batch "Basics"

Quality's Perspective - Batch Reporting

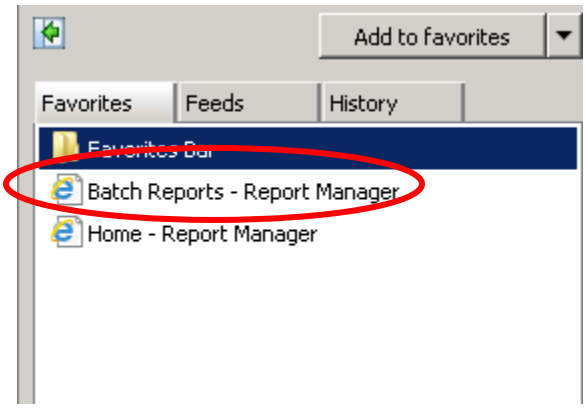
In quality, you strive toward the highest level of product standards. You may continuously work to understand past batches while working to improve future production. Having batch data at your fingertips is crucial to solving the day-to-day conditions that arise. In this user perspective, you will use web-based reporting to view abnormal batch states, system alarms, and out-of-tolerance conditions for a detailed batch. Perform a mock product recall through a backward tracing search on a batch to identify all raw materials and equipment used. Once the problem is found, perform a raw material or equipment forward tracking search to identify all affected historical batches. And last but not least, run a material usage report to identify how much of a new material has been used in production.

Lab 1: Factory Talk Batch "Basics"

View Batch Reports

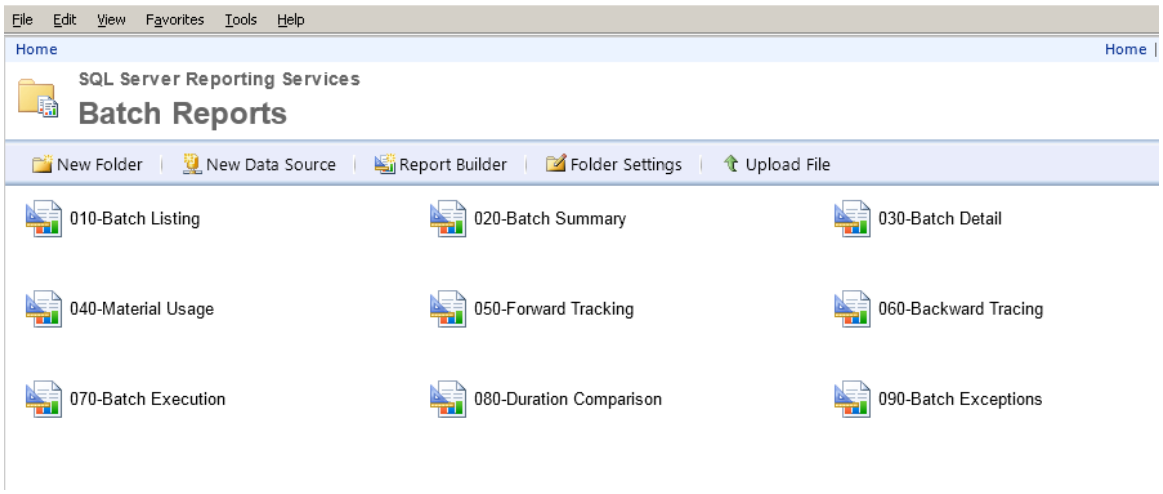
1. From the windows taskbar, select ***Internet Explorer***.

2. From the ***Favorites*** menu **,** select ***Batch Reports – Report Manager***.



NOTE: It may take a couple of minutes to get all the services loaded and running.

3. The home screen will load. From this page, all pre-defined reports are available.



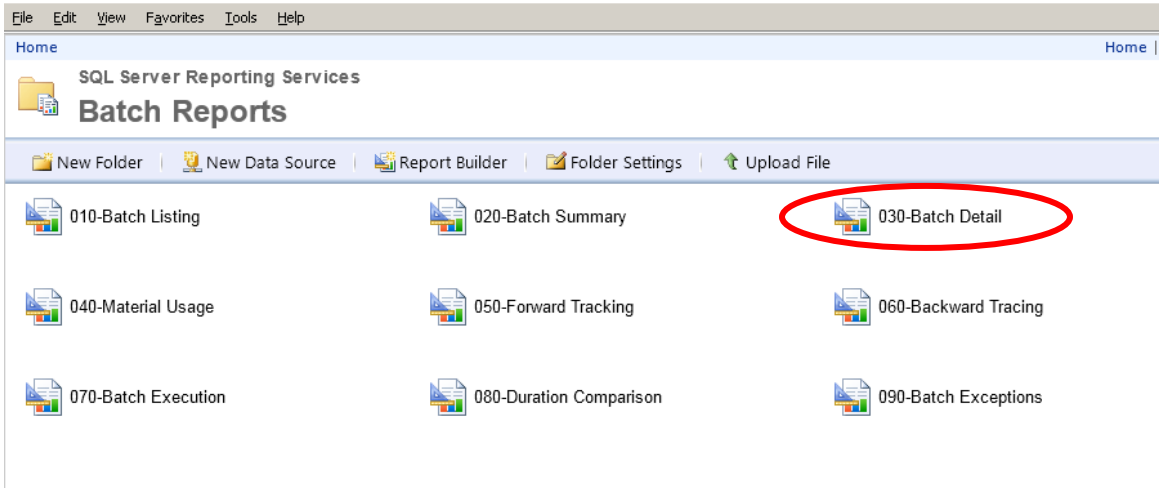
Lab 1: Factory Talk Batch "Basics"

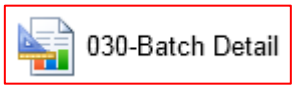
Batch Detail Report

In the Quality role, you may be interested in reviewing the details of specific batches. Recently, Production has asked you to review Batch ID = 20140503_PROD_A10 (Unique ID = 11). They noted that the batch did not run correctly and had to be stopped. Let's take a look!

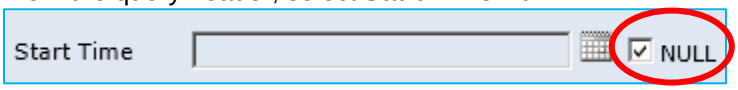
1. From the top of the report, click on ***Batch Reports***.

2. This will return us to the main window that lists all available reports.



3. Select ***030-Batch Detail*** 

4. From the query header, select ***Start Time Null***

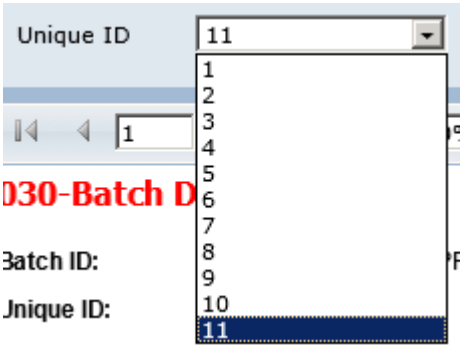


5. We will leave the ***End Time*** set to the current date and time. No action needed.

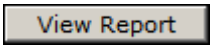
> **NOTE:** We use the "Null" setting for start time to quickly search the entire batch history.

Lab 1: Factory Talk Batch "Basics"

6. Since Production gave us the specific "Unique ID = ", select 11 from the ***Unique ID*** dropdown.

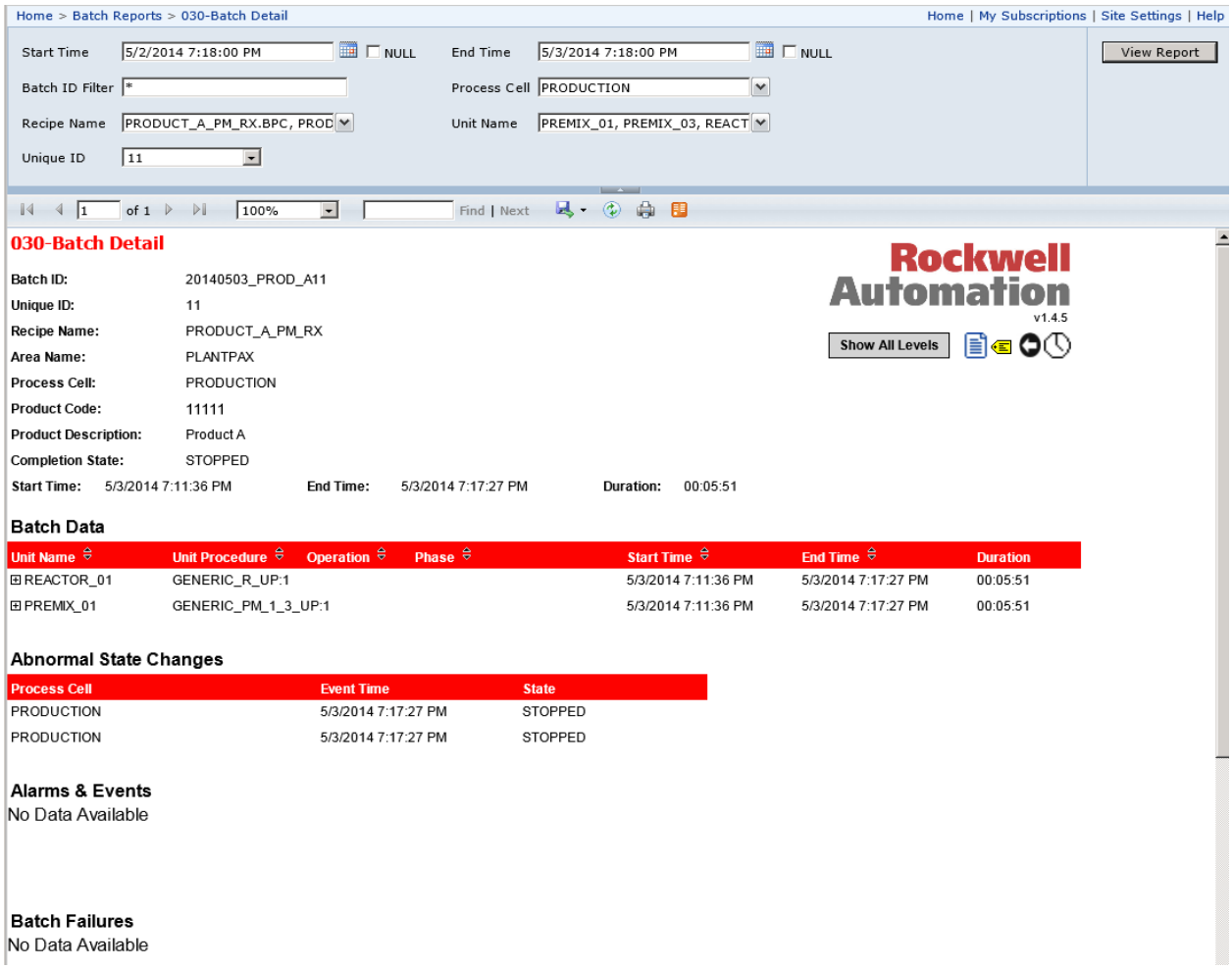


If Unique ID is not present, check ***Select All*** in Recipe Name drop box.

7. From the top right side of the report, select ***View Report*** 

8. The "Batch Detail" report will appear for Unique ID = 11. (Batch ID = 20140503_PROD_A11).

Lab 1: Factory Talk Batch "Basics"



Home > Batch Reports > 030-Batch Detail — Home | My Subscriptions | Site Settings | Help

Start Time 5/2/2014 7:18:00 PM NULL — End Time 5/3/2014 7:18:00 PM NULL — View Report

Batch ID Filter * — Process Cell PRODUCTION

Recipe Name PRODUCT_A_PM_RX.BPC, PROD — Unit Name PREMIX_01, PREMIX_03, REACT

Unique ID 11

1 of 1 — 100% — Find | Next

030-Batch Detail

Rockwell Automation v1.4.5

Show All Levels

Batch ID:	20140503_PROD_A11
Unique ID:	11
Recipe Name:	PRODUCT_A_PM_RX
Area Name:	PLANTPAX
Process Cell:	PRODUCTION
Product Code:	11111
Product Description:	Product A
Completion State:	STOPPED

Start Time: 5/3/2014 7:11:36 PM End Time: 5/3/2014 7:17:27 PM Duration: 00:05:51

Batch Data

Unit Name	Unit Procedure	Operation	Phase	Start Time	End Time	Duration
⊞ REACTOR_01	GENERIC_R_UP:1			5/3/2014 7:11:36 PM	5/3/2014 7:17:27 PM	00:05:51
⊞ PREMIX_01	GENERIC_PM_1_3_UP:1			5/3/2014 7:11:36 PM	5/3/2014 7:17:27 PM	00:05:51

Abnormal State Changes

Process Cell	Event Time	State
PRODUCTION	5/3/2014 7:17:27 PM	STOPPED
PRODUCTION	5/3/2014 7:17:27 PM	STOPPED

Alarms & Events

No Data Available

Batch Failures

No Data Available

Setpoint vs Actual Summary

Recipe	Label	Setpoint	Target	Actual	Deviation
11:PRODUCT_A_PM_RX\GENERIC_PM_1_3_UP:1\GENERIC_PM_1_3_OP:1 \ADDITION_01:1-1	SETPOINT_01	200.000	200.000	204.989	4.989
11:PRODUCT_A_PM_RX\GENERIC_PM_1_3_UP:1\GENERIC_PM_1_3_OP:1 \ADDITION_02:1-1	SETPOINT_01	125.000	125.000	128.267	3.267
11:PRODUCT_A_PM_RX\GENERIC_PM_1_3_UP:1\GENERIC_PM_1_3_OP:1 \ADDITION_03:1-1	SETPOINT_01	25.000	25.000	28.211	3.211
11:PRODUCT_A_PM_RX\GENERIC_PM_1_3_UP:1\GENERIC_PM_1_3_OP:1 \MANUAL_ADD:1-1	SETPOINT_01	35.000		35.100	0.100
11:PRODUCT_A_PM_RX\GENERIC_PM_1_3_UP:1\GENERIC_PM_1_3_OP:1 \SAMPLE_PH:1-1	SETPOINT_PH	7.500		10.000	2.500
11:PRODUCT_A_PM_RX\GENERIC_R_UP:1\GENERIC_R_OP:1\AGITATE_VFD:1-1	SETPOINT_HOLD_SPEED	50.000		0.0000	-50.000
11:PRODUCT_A_PM_RX\GENERIC_R_UP:1\GENERIC_R_OP:1\AGITATE_VFD:1-1	SETPOINT_RUN_SPEED	50.000		0.0000	-50.000
11:PRODUCT_A_PM_RX\GENERIC_R_UP:1\GENERIC_R_OP:1\HEADER_ADD:1-1	SETPOINT_01	300.000	300.000	313.744	13.744

From above we can see the pH was too high, the reason the batch was stopped.

Lab 1: Factory Talk Batch "Basics"

NOTE: Alternatively you could have accessed this report by selecting the batch detail hotlink icon from the batch list report.

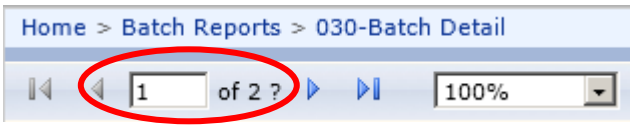
NOTE: The batch detail report shows the detail for several aspects of the batch. This includes: 1) batch data 2) abnormal state changes 3) alarms & events 4) batch failures 5) setpoint vs. actual table. The batch data table can be expanded down to see more detail as needed. The default view is "collapsed" to show the units used in the batch. The "Show All Levels" option is available from the button in the report header. This quickly expands the report to multiple pages to show all detail. Use this option just prior to printing.

Lab 1: Factory Talk Batch "Basics"

9. Since the default view is collapsed, select ***Show All Levels***

to get a detailed view.

10. After "showing all levels", notice that the report is now split into multiple pages to show the large amount of detailed data. Use the page control in the report toolbar to move between pages.



11. After "showing all levels", the "Batch Data" table will have expanded. From here we can see the detailed information for all Unit Procedures, Operations, & Phases that executed. Each line represents a different part of the batch and includes start time, end time, & duration. Each phase is further expanded to show the Recipe Parameters and Report Parameters configured for the batch. This offers a complete record of batch activity.

Batch Data

Unit Name	Unit Procedure	Operation	Phase	Start Time	End Time	Duration
⊟ REACTOR_01	GENERIC_R_UP:1			5/3/2014 7:11:36 PM	5/3/2014 7:17:27 PM	00:05:51
		⊟ GENERIC_R_OP:1		5/3/2014 7:11:36 PM	5/3/2014 7:17:27 PM	00:05:51
			⊟ MESSAGE_HMI:1	5/3/2014 7:11:36 PM	5/3/2014 7:11:36 PM	00:00:00
				Recipe Parameter	**Value**	**EU**
				H_LINE_1	**********	
				H_LINE_2	**** BATCH HELD *****	
				H_LINE_3	**********	
				R_LINE_1	** ******** OPERATOR PROMPT ********** IF MESSAGE REMAINS	
				R_LINE_2	CONFIRMING THAT ALL OF THE EQUIPMENT IS READY TO PRODUCE	
				R_LINE_3	CHECKING THAT ALL UNIT EQUIPMENT IS IN AUTO	
			⊟ MESSAGE_HMI:2	5/3/2014 7:11:36 PM	5/3/2014 7:11:50 PM	00:00:14
				Recipe Parameter	**Value**	**EU**
				H_LINE_1	**********	
				H_LINE_2	**** BATCH HELD *****	
				H_LINE_3	**********	
				R_LINE_1	TEMPERATURE SET POINT 100 DEG C	
				R_LINE_2	WARMING UP TO MORE THAN 88 DEG BEFORE MATERIAL ADDITION	
				R_LINE_3		

NOTE: The user can sort each column by selecting the "sort arrows" in the red banner bar.

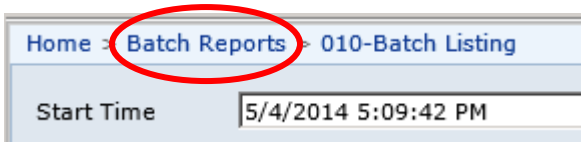
Lab 1: Factory Talk Batch "Basics"

Batch Execution Report

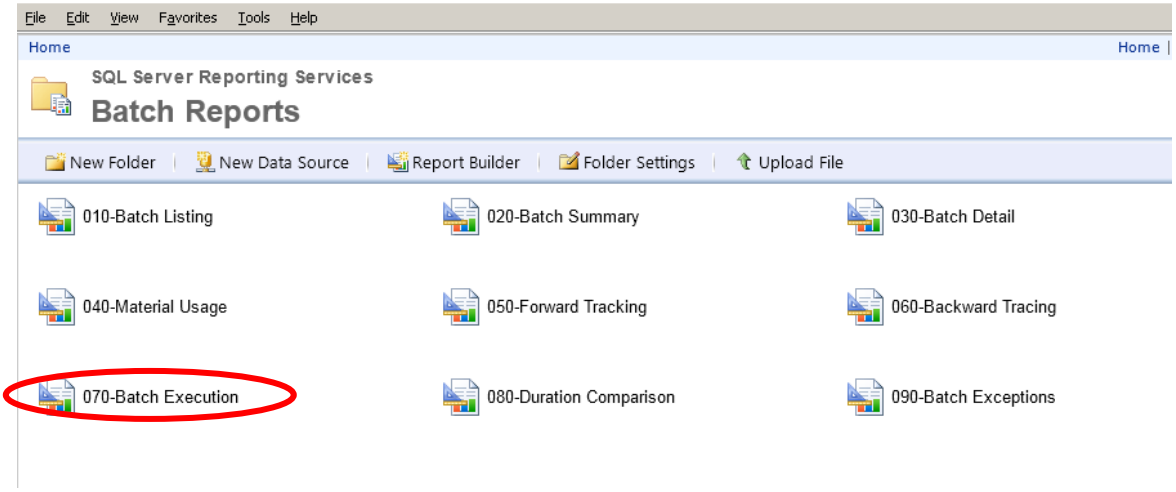
Better understanding the details of batch execution can lead to optimization of cycle time. It can also give a clear picture of what happened during the product run.

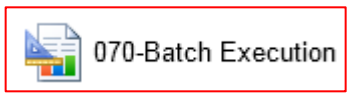
In this example we will look at how long it took the operator to complete the manual addition's step within Unique ID = 606

1. From the top of the report, click on ***Batch Reports***.



2. This will return us to the main window that lists all available reports.



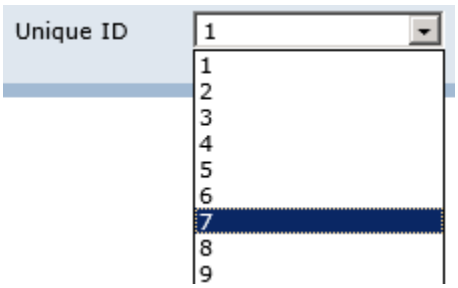
3. Select ***070-Batch Execution*** 

4. From the query header, select ***Start Time Null***

5. We will leave the ***End Time*** set to the current date and time. No action needed.

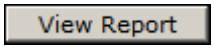
> **NOTE:** We use the "Null" setting for start time to quickly search the entire batch history.

Lab 1: Factory Talk Batch "Basics"



6. From the ***Unique*** ID dropdown, select ***7***

If Unique ID is not present, check ***Select All*** in Recipe Name drop box.

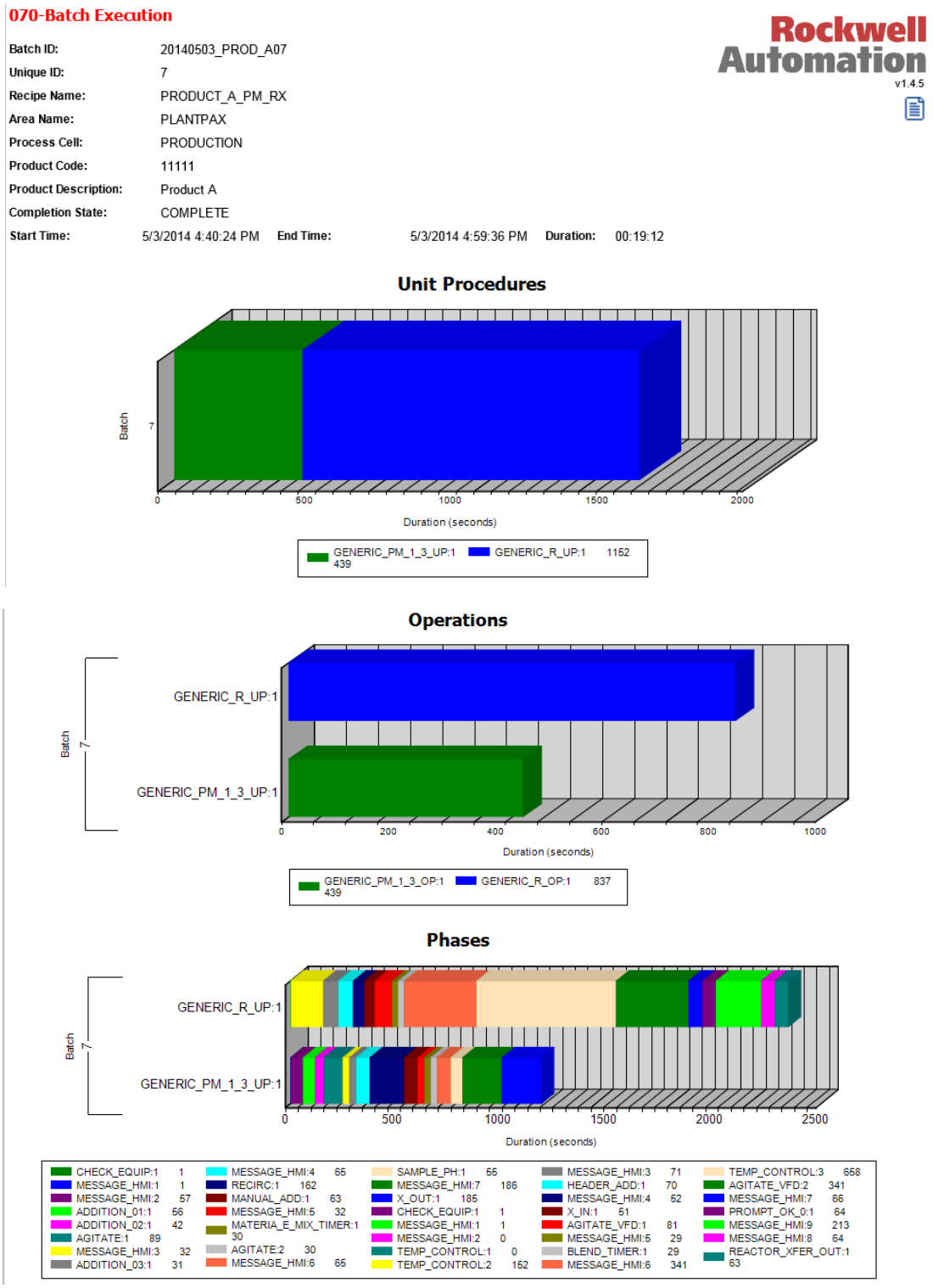
7. From the top right side of the report, select ***View Report*** 

NOTE: Alternatively you could have accessed this report by selecting the batch execution hotlink icon from the batch list report.

8. The "Batch Execution" report will appear for Unique ID = 7. This report graphically shows the detailed time execution of the batch. To maximize the value of this report, the user needs an understanding of the process. In this production process, the premix material is first created and then added to the reactor. Any delay in the premix process can delay the overall reactor cycle time. Here we can see that the Manual Add took 63 seconds to complete. MANUAL_ADD:1 63 . With this information we can optimize the overall batch cycle time by reducing this time.

Lab 1: Factory Talk Batch "Basics"

9.



Lab 1: Factory Talk Batch "Basics"

Track & Trace

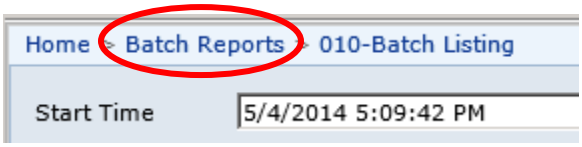
Track and Trace requirements are a very critical in many industries today. Track & Trace can be separated into the following two parts.

- Forward Tracking enables a search on raw material lot or equipment to provide a list of all final batches that used that material or equipment. This is primarily used when there is a raw material recall or issues with equipment are discovered.
- Backward Tracing enables a search on a specific batch produced and returns the list of all raw material lots and equipment used in that batch. This is primarily used to determine all items in the batch when a defective batch is identified. (i.e. Customer issue or final product recall.)

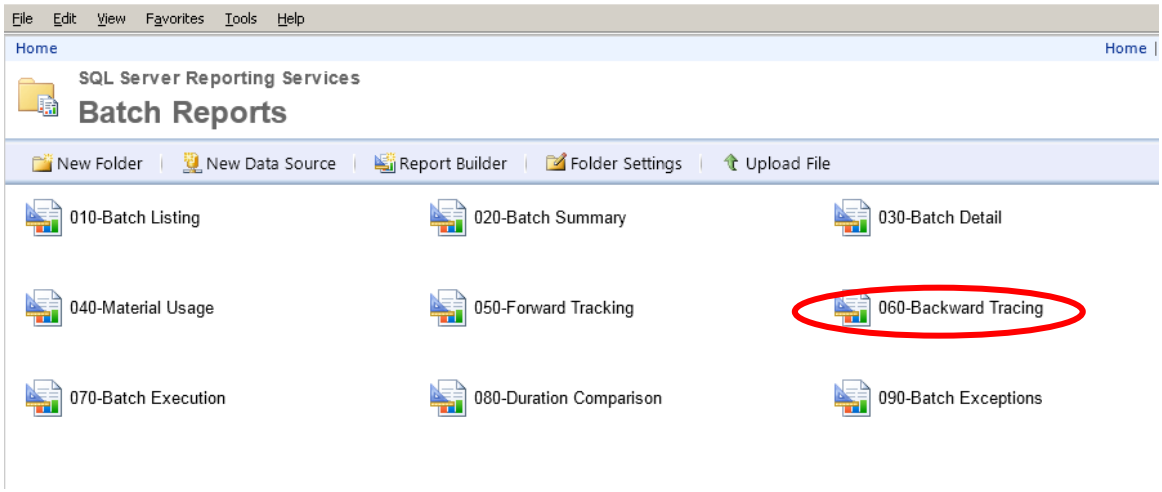
Backward Tracing

In this example we will perform a mock recall based on a customer issue with the final product. The data given by the customer indicates that "Batch ID 20140503_PROD_A06" is in question. Let's find all material and equipment used by this batch!

1. From the top of the report, click on ***Batch Reports***.

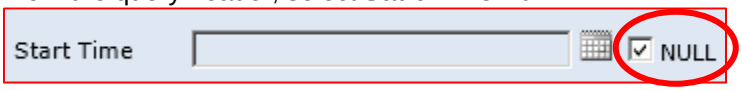


2. This will return us to the main window that lists all available reports.



3. Select ***060-Backward Tracing***

4. From the query header, select ***Start Time Null***

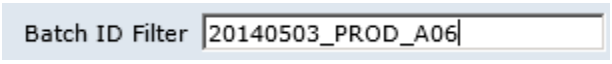


5. We will leave the ***End Time*** set to the current date and time. No action needed.

> **NOTE:** We use the "Null" setting for start time to quickly search the entire batch history.

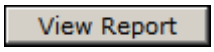
Lab 1: Factory Talk Batch "Basics"

6. From the query header, enter ***20130430_PROD_A06**** into the "Batch ID Filter" and hit the ***Enter*** key



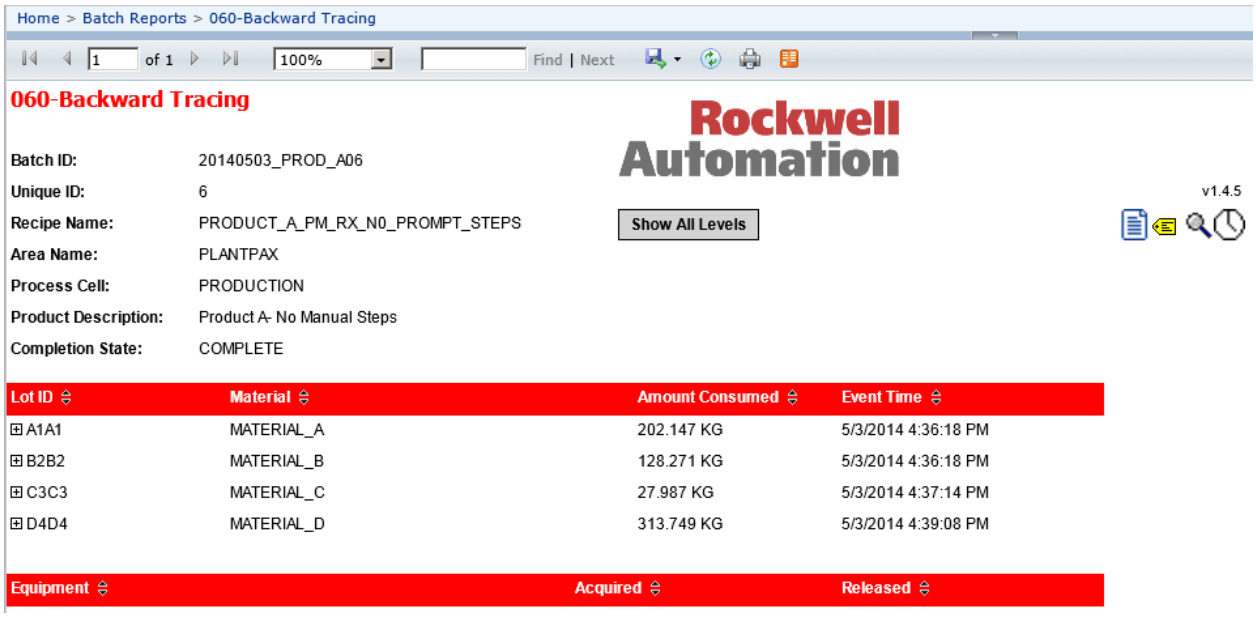
7. This complete Batch ID will trim the "Unique ID" dropdown to the single batch in question. Select 6 from the ***Unique ID*** dropdown.

   If Unique ID is not present, check ***Select All*** in Recipe Name drop box.

8. From the top right side of the report, select ***View Report*** 

NOTE: Alternatively you could have accessed this report by selecting the backward tracing hotlink icon from the batch list report.

9. The "Backward Tracing" report will appear for Unique ID = 6. (Batch ID = 20140503_PROD_A06). In this report we can see a listing of all materials, lots, quantities, and event times along with all equipment used by the batch.



10. Since the default view is collapsed, select ***Show All Levels***

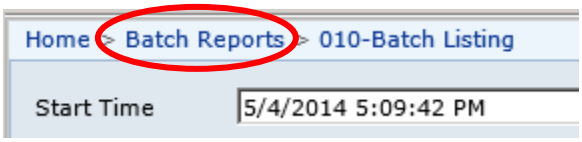
to get additional data for each line.

Lab 1: Factory Talk Batch "Basics"

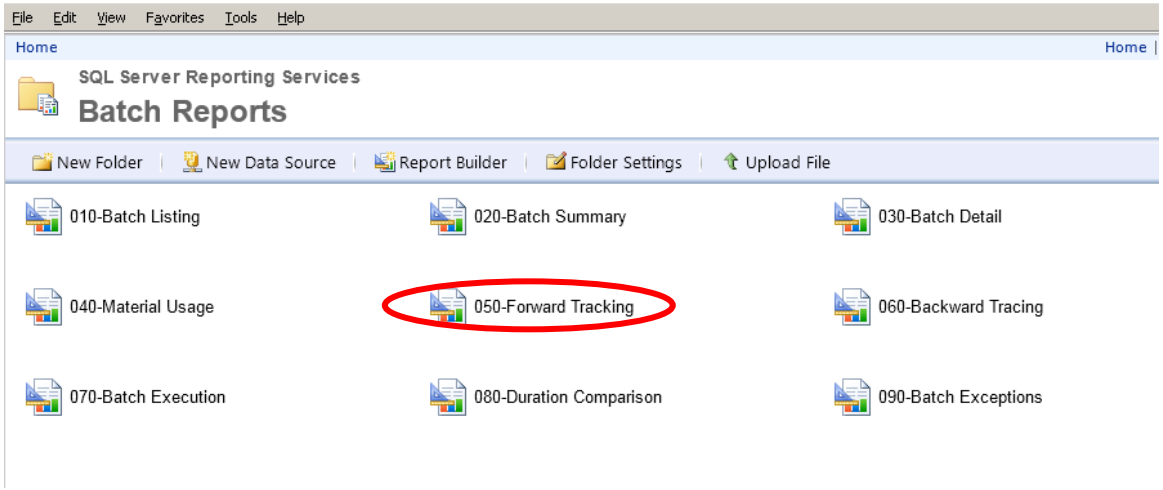
Forward Tracking

In this example we will perform a raw material mock recall. The data given by the manufacturer is that Lot "A1A1" is in question. Let's find all batches that used this material.

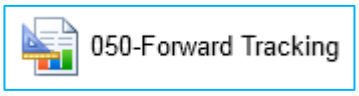
1. From the top of the report, click on ***Batch Reports***.



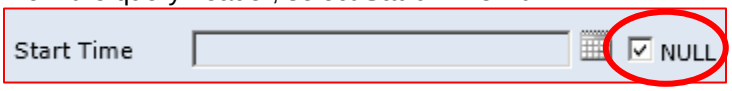
2. This will return us to the main window that lists all available reports.



3. Select ***050-Forward Tracking***



4. From the query header, select ***Start Time Null***



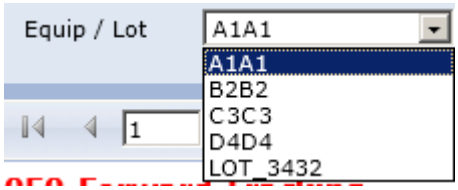
5. We will leave the ***End Time*** set to the current date and time. No action needed.

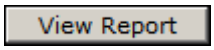
> **NOTE:** We use the "Null" setting for start time to quickly search the entire batch history.

Lab 1: Factory Talk Batch "Basics"

6. The "Forward Tracking" report introduces the new selection "Report Type". This dropdown allows the user to define if the search should be by "Lot" or by "Equipment". For this example, select ***Lot*** from the dropdown

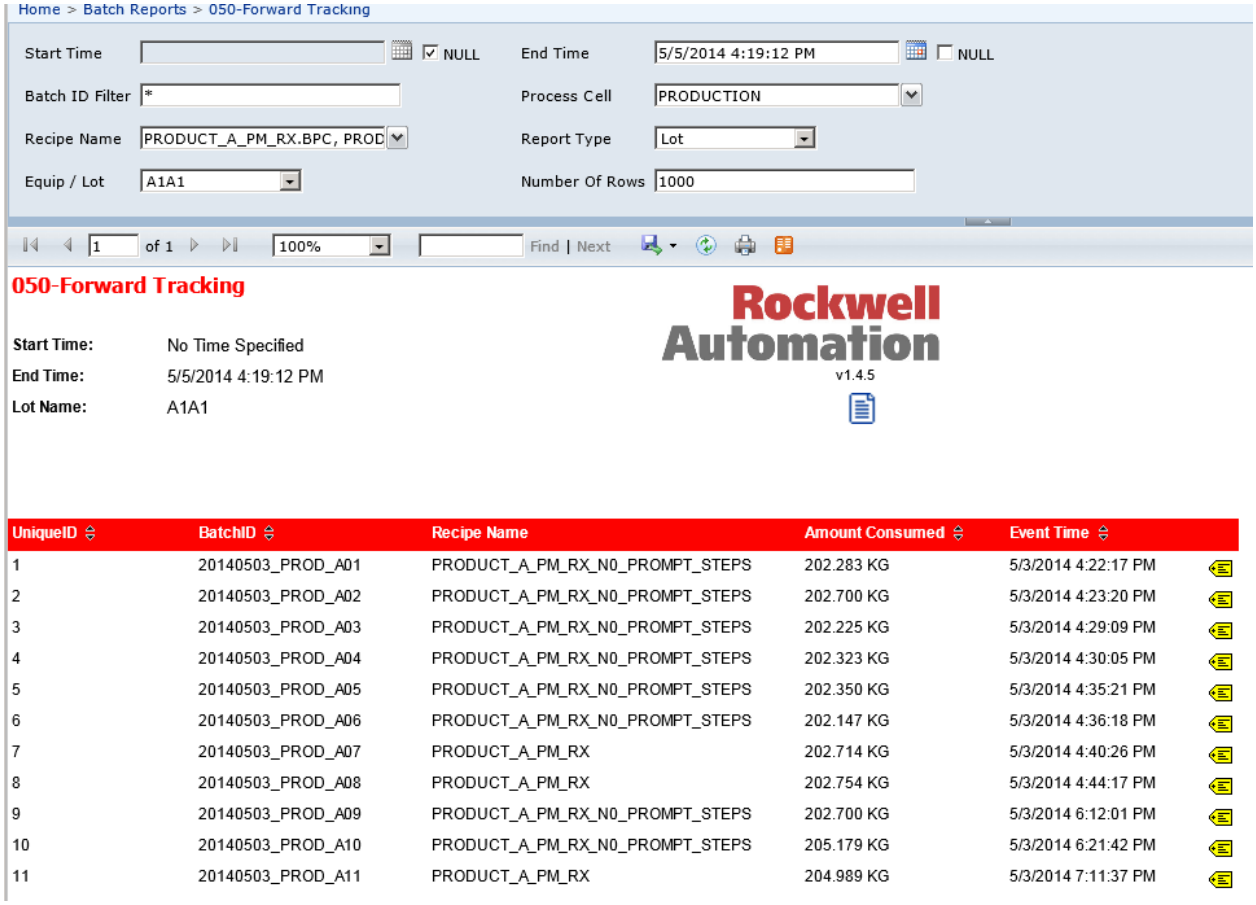
7. The "Forward Tracking" report also introduces the new selection "Equip/Lot". This dropdown allows the user to define which "Lot" or "Equipment" should be used in the search. This dropdown dynamically changes based on the user selection of "Report Type" For this example, select ***A1A1*** from the dropdown



8. From the top right side of the report, select ***View Report*** 

Lab 1: Factory Talk Batch "Basics"

9. The "Forward Tracking" report will appear. Each line of this report shows the Batch ID, recipe name, amount consumed, and event time for the consumption of "A1A1".



UniqueID	BatchID	Recipe Name	Amount Consumed	Event Time
1	20140503_PROD_A01	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.283 KG	5/3/2014 4:22:17 PM
2	20140503_PROD_A02	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.700 KG	5/3/2014 4:23:20 PM
3	20140503_PROD_A03	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.225 KG	5/3/2014 4:29:09 PM
4	20140503_PROD_A04	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.323 KG	5/3/2014 4:30:05 PM
5	20140503_PROD_A05	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.350 KG	5/3/2014 4:35:21 PM
6	20140503_PROD_A06	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.147 KG	5/3/2014 4:36:18 PM
7	20140503_PROD_A07	PRODUCT_A_PM_RX	202.714 KG	5/3/2014 4:40:26 PM
8	20140503_PROD_A08	PRODUCT_A_PM_RX	202.754 KG	5/3/2014 4:44:17 PM
9	20140503_PROD_A09	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	202.700 KG	5/3/2014 6:12:01 PM
10	20140503_PROD_A10	PRODUCT_A_PM_RX_N0_PROMPT_STEPS	205.179 KG	5/3/2014 6:21:42 PM
11	20140503_PROD_A11	PRODUCT_A_PM_RX	204.989 KG	5/3/2014 7:11:37 PM

NOTE: If you are interested in seeing more detail on the specific batch. Select the yellow tag hotlink icon to take you to the batch summary report.

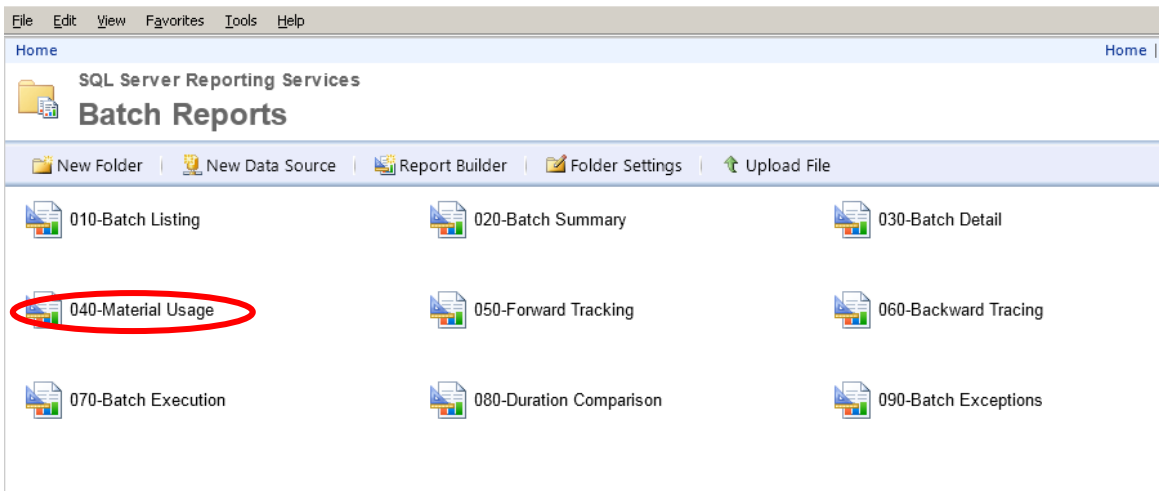
Lab 1: Factory Talk Batch "Basics"

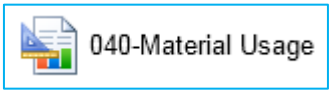
Material Usage

Understanding material usage and consumption can be very useful. In this example, we will further explore the capabilities of the batch system by running a material usage report for "Material A"

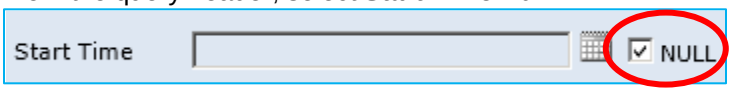
1. From the top of the report, click on ***Batch Reports***.

2. This will return us to the main window that lists all available reports.



3. Select ***040-Material Usage*** 

4. From the query header, select ***Start Time Null***

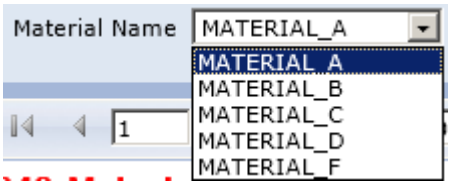


5. We will leave the ***End Time*** set to the current date and time. No action needed.

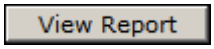
> **NOTE:** We use the "Null" setting for start time to quickly search the entire batch history.

Lab 1: Factory Talk Batch "Basics"

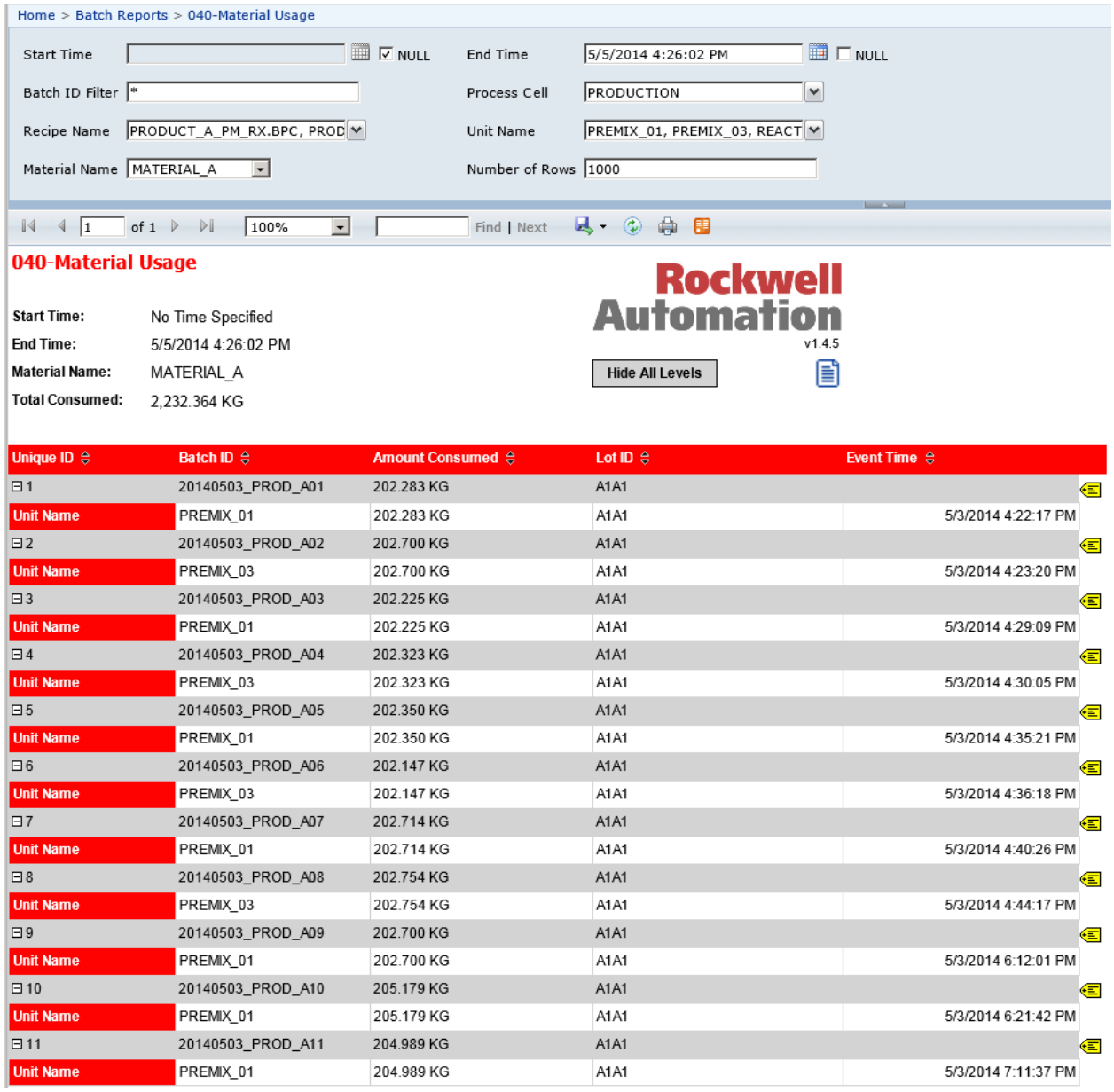
6. The "Material Usage" report introduces the new selection "Material Name". This dropdown allows the user to define which material to search for. For this example, select ***Material_A*** from the dropdown



Lab 1: Factory Talk Batch "Basics"

7. From the top right side of the report, select ***View Report*** 

8. The "Material Usage" report will appear. Each line of this report shows the Unique ID, Batch ID, amount consumed, & Lot ID consumed for "Material_A". By expanding each line, you can also see the unit that used the material, along with the consumption event time.



Unique ID	Batch ID	Amount Consumed	Lot ID	Event Time
⊟1	20140503_PROD_A01	202.283 KG	A1A1	
Unit Name	PREMIX_01	202.283 KG	A1A1	5/3/2014 4:22:17 PM
⊟2	20140503_PROD_A02	202.700 KG	A1A1	
Unit Name	PREMIX_03	202.700 KG	A1A1	5/3/2014 4:23:20 PM
⊟3	20140503_PROD_A03	202.225 KG	A1A1	
Unit Name	PREMIX_01	202.225 KG	A1A1	5/3/2014 4:29:09 PM
⊟4	20140503_PROD_A04	202.323 KG	A1A1	
Unit Name	PREMIX_03	202.323 KG	A1A1	5/3/2014 4:30:05 PM
⊟5	20140503_PROD_A05	202.350 KG	A1A1	
Unit Name	PREMIX_01	202.350 KG	A1A1	5/3/2014 4:35:21 PM
⊟6	20140503_PROD_A06	202.147 KG	A1A1	
Unit Name	PREMIX_03	202.147 KG	A1A1	5/3/2014 4:36:18 PM
⊟7	20140503_PROD_A07	202.714 KG	A1A1	
Unit Name	PREMIX_01	202.714 KG	A1A1	5/3/2014 4:40:26 PM
⊟8	20140503_PROD_A08	202.754 KG	A1A1	
Unit Name	PREMIX_03	202.754 KG	A1A1	5/3/2014 4:44:17 PM
⊟9	20140503_PROD_A09	202.700 KG	A1A1	
Unit Name	PREMIX_01	202.700 KG	A1A1	5/3/2014 6:12:01 PM
⊟10	20140503_PROD_A10	205.179 KG	A1A1	
Unit Name	PREMIX_01	205.179 KG	A1A1	5/3/2014 6:21:42 PM
⊟11	20140503_PROD_A11	204.989 KG	A1A1	
Unit Name	PREMIX_01	204.989 KG	A1A1	5/3/2014 7:11:37 PM

NOTE: The Material Usage report provides a "Total Consumed" amount in the header of the report. This example shows that 2,232.364 Kg was consumed. By adjusting the time, unit, recipe, batch ID filters a user can run various consumption reports for shift, line, product, etc.

Lab 1: Factory Talk Batch "Basics"

The Quality Perspective is now complete!

For further references see: PlantPAx Table of Content – AID #62366

Lab 2: Factory Talk Batch "eProcedure"

Lab2: Factory Talk Batch "eProcedure"

Lab2: Factory Talk Batch "eProcedure"

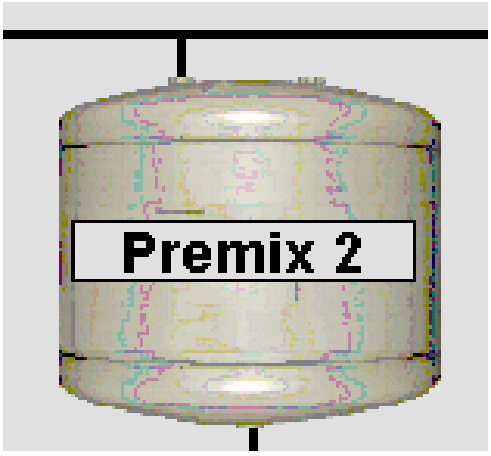
Sample Process Overview:

PlantPAx Factory Talk eProcedure is a component of FactoryTalk Batch, its primary purpose is to enable the interaction between the operator and the control system and this is primarily used when the required activities can't be performed automatically because there is no automation component to perform that task.

This lab will show the user how the commonly found paper based manual operating procedures can be converted into electronic work instructions driven procedures, this lab uses predefined generic instructions to create and execute a recipe. It also shows how to create a new instruction.

Premix 2 is a premix unit that has no automation; we wish to convert all the paper driven standard operating procedures (SOP) into a set of electronic work instructions.

Premix 2 is shown on the Process Overview display, but when you drill down to the Premix 2 unit from the Batch navigation bar there is no process equipment. The display consists of the FactoryTalk Batch ControlRecipeList and ProcedureView ActiveX controls along with command buttons.



Lab 2: Factory Talk Batch "eProcedure"

Sample SOP

The following is a sample SOP that is performed in Premix 2.

Product C manufacturing procedure.

Product Identifier: Product_C_PM2
Version Number: 1.0
Author: DemoUser
Product Name: Product C
Product Code: 1234
Batch size: 385 Kg
Estimated Duration: 20 minutes
Procedure description: Manual Manufacturing of intermediate product C.
Step:

1. Confirm the Premix unit is clean and ready before proceeding, operator signature required.
2. Add **200 Kg** of Material A to tank, record actual amount as well as lot ID.
3. Start Agitator.
4. Add **125 Kg** of Material B to tank, record actual amount as well as lot ID.
5. Add **25 Kg** of Material C to tank, record actual amount as well as lot ID.
6. Add **35 Kg** of Material E to tank, record actual amount as well as lot ID.
7. Start recirculation.
8. Stop Agitator.
9. Wait 30 seconds.
10. Take a pH sample
11. If pH less than 6 or greater than 9.5 requires Supervisor or Engineer signoff.
12. Transfer product to a tote.

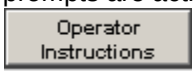
Lab 2: Factory Talk Batch "eProcedure"

Operator Perspective:

The HMI incorporates several ways to use the eProcedure client:

1. Select the ***eProcedure View*** button

to bring up a display that consists of a Microsoft Webbrowser control pointed at the eProcedure URL, this is the complete eProcedure Client in a FactoryTalk View display.
2. Select the ***Batch Premix 2*** button

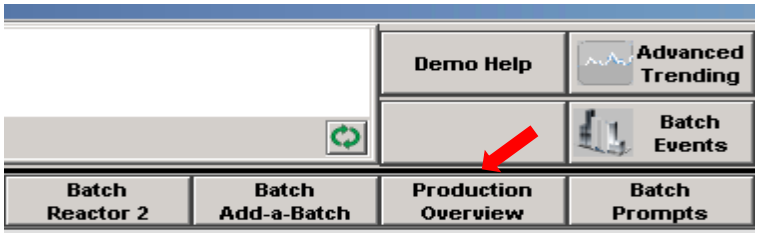
to bring up a display that consists of same Batch ActiveX controls as on the other unit displays, minus process objects. From here batches can be added and commanded using the command buttons. When eProcedure instruction prompts are active they can be access by selecting the ***Operator Instruction*** button 

or form the navigation bar the ***Batch Instruction*** button

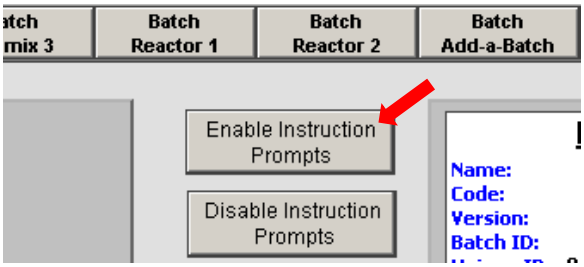
.
3. The final way to use the client is to start Internet Explorer which by default is set up with eProcedure Server machine as the home page when the eProcedure Client is installed.

The HMI project has a display that runs in the background that is used to notified operators when there are eProcedure instructions present. Follow the following steps to start this display.

1. From the navigation bar select ***Production Overview***.

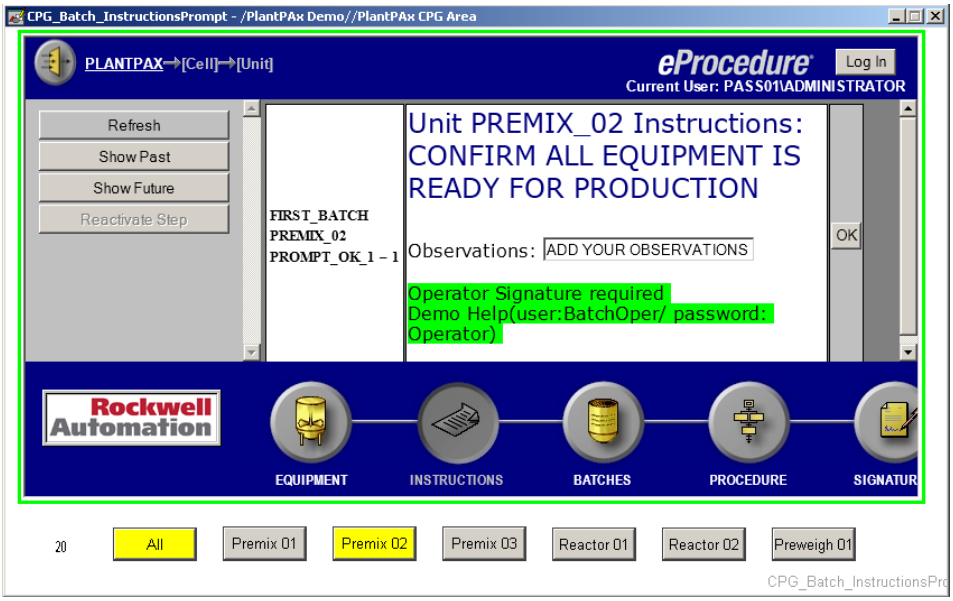


2. On the Production Overview display select ***Enable Instruction Prompts***.



Lab 2: Factory Talk Batch "eProcedure"

3. This brings up the display shown below, which consists of a Microsoft WebBrowser ActiveX control pointed at the eProcedure Instruction page. VBA script runs in the background that checks for the present of instructions on the eProcedure instruction page. When instructions are present it sets a bit which makes the instruction present icon visible . Additional VBA code filters the instructions by units, e.g. in the graphic below there are instructions present for Premix 02.



4. The setting for the above display are set for cache, always updating, closing the display or navigating to another display will not stop the VBA code running. Selecting ***Disable Instruction Prompts*** fill flush the cache turning off the instruction prompting.

Let run a batch

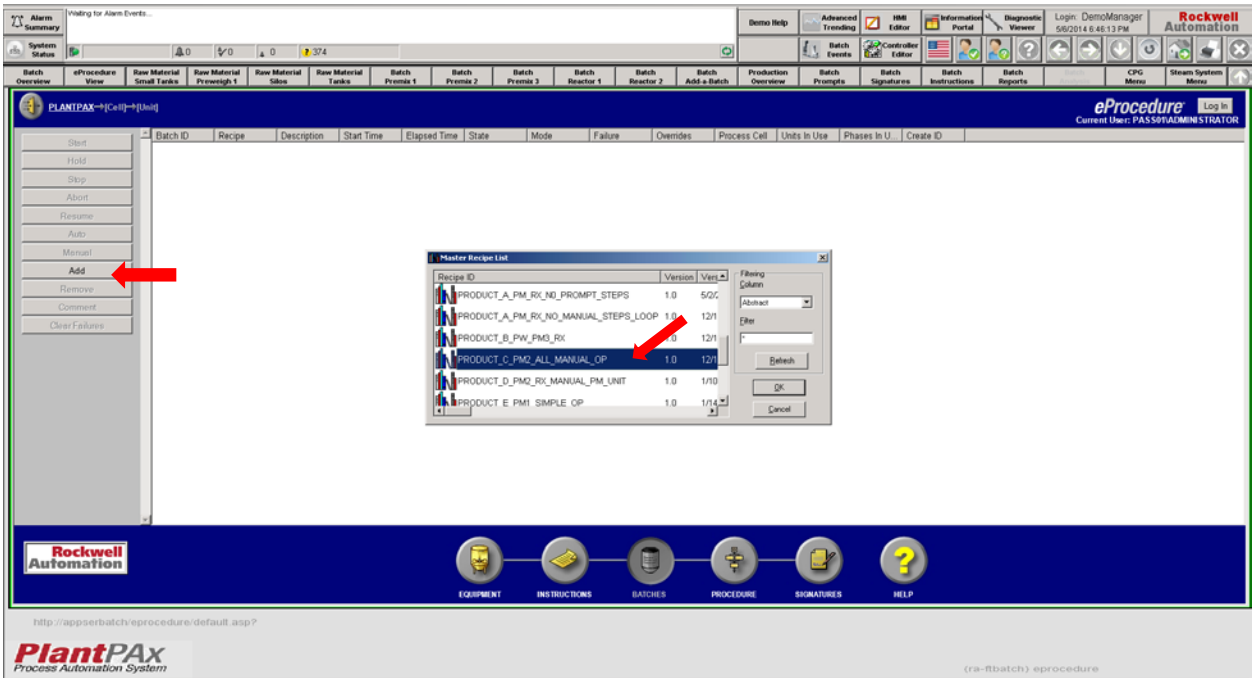
1. From the navigation bar select the ***eProcedure View*** button

this opens the eProcedure Client display.

2. Select the **ADD** button to add a batch of **Product C** to the batch list.

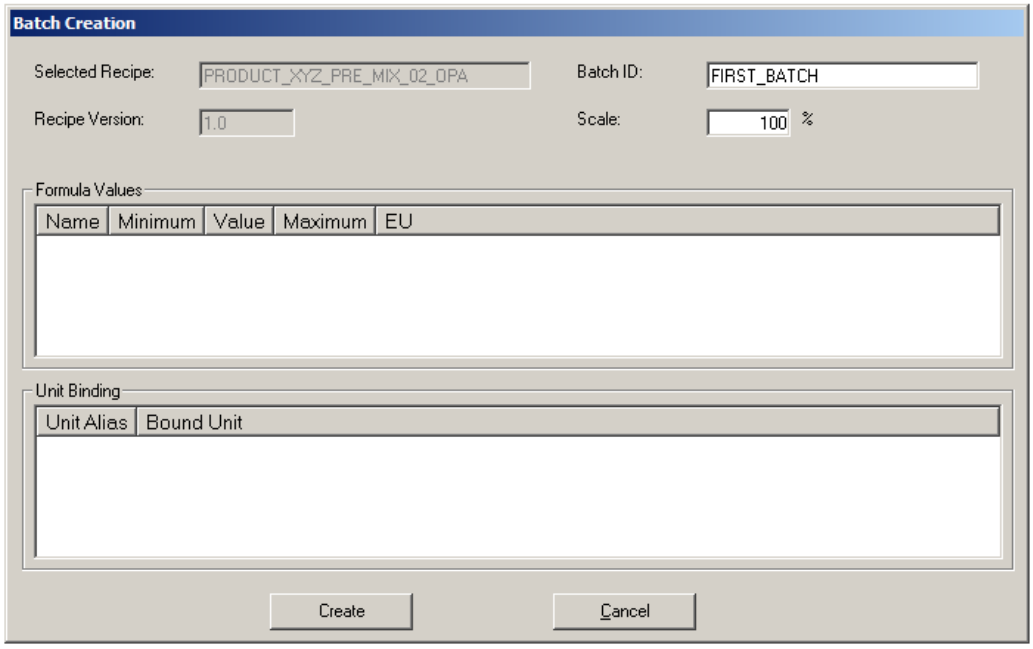
Lab 2: Factory Talk Batch "eProcedure"

3. Select the "**PRODUCT_C_PM2_ALL_MANUAL_OP**" recipe, and then select **OK.**

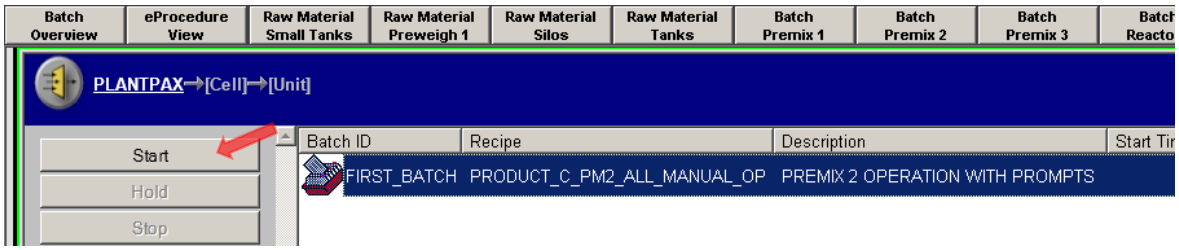


Lab 2: Factory Talk Batch "eProcedure"

4. Give the batch a batch ID then select Create.



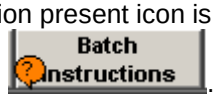
5. Select the batch from the list then select **Start**.



6. Select the **INSTRUCTION** button at the bottom of the display; this will take you to the main operator interface for prompted instructions.

If prompts are present this button will blink (very faint blink)

7. Also, when instructions are present, the instruction present icon is visible on the unit buttons

and **Batch Instructions** button 

.
8. For now we will stay on the eProcedure View display.

Lab 2: Factory Talk Batch "eProcedure"

9. Follow the instructions presented. When signatures are required you can use the following User IDs:

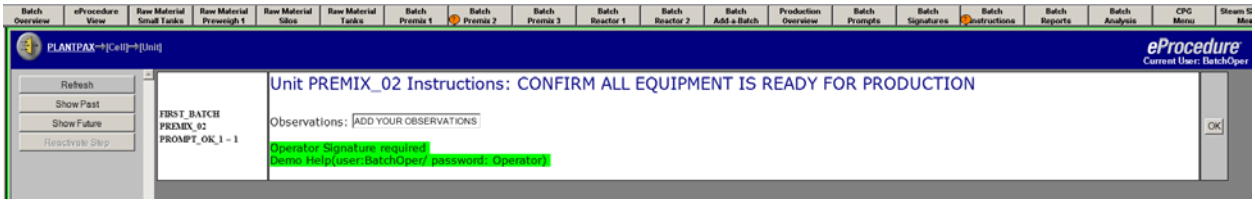
   User ID: **O1** with no password for operator
   User ID: **S1** with no password for supervisor
   User ID: **E1** with no password for engineer

Once the batch is started the following instruction prompts will be displayed during the execution of the selected recipe (Product_C product SOP)

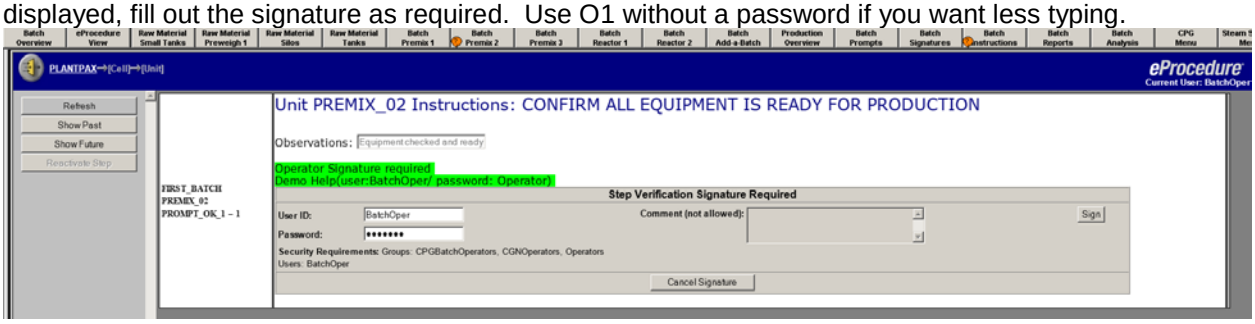
Electronic Work instructions operator view

Step 1 - Confirm the Premix unit is ready for production, operator signature required to proceed.

The following prompts will be presented. The 'Observations' text box allows the operator to add a note to the instruction which will show up as a Batch report parameter.



Because this prompt was originated from a phase requiring a signature the signature window will be displayed, fill out the signature as required. Use O1 without a password if you want less typing.



Lab 2: Factory Talk Batch "eProcedure"

Step 2-Add 200 Kg of Material A to tank, record actual amount as well as lot ID.

Step 3 –Start the Agitator.

Step 4 –Add 125 Kg of Material B to tank, record actual amount as well as lot ID.

Step 5 – Add 25 Kg of Material C to tank, record actual amount as well as lot ID.

Step 6 – Add 35 Kg of Material E to tank, record actual amount as well as lot ID.

Step 7 – Turn on tank recirculation.

Step 8 – Stop the agitator.

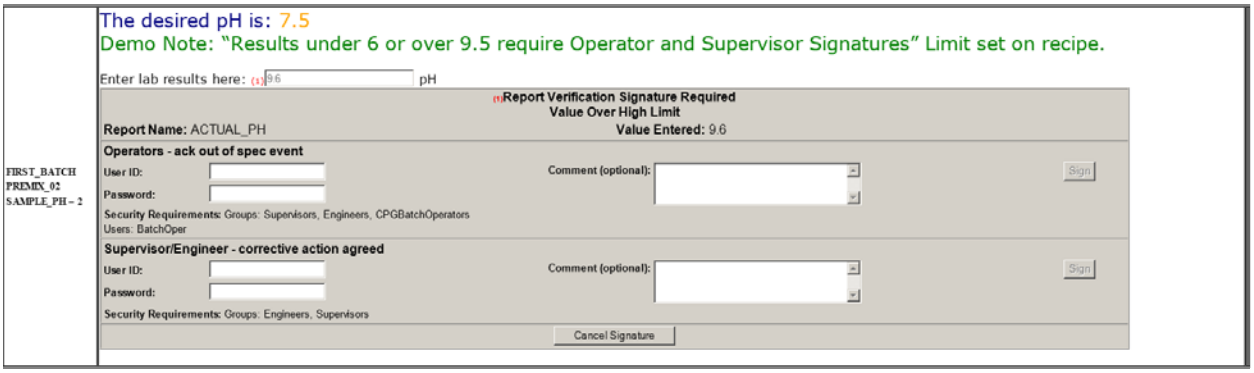
Lab 2: Factory Talk Batch "eProcedure"

Step 9 - Wait 30 seconds to allow material to fuse.

Step 10 – Take a pH sample.

Step 11 – Record the pH. If the pH is out of range it needs an Operator and Supervisor signatures, at this point the batch would probably be scrapped. Enter a value above 9.5 to bring up the signature instruction.

Step 11 – Sign off the signature using BatchOper/Operator or O1/no password for Operator user and password. Sign off the Supervisor/Engineer with Supervisor/Supervisor or S1/no password .

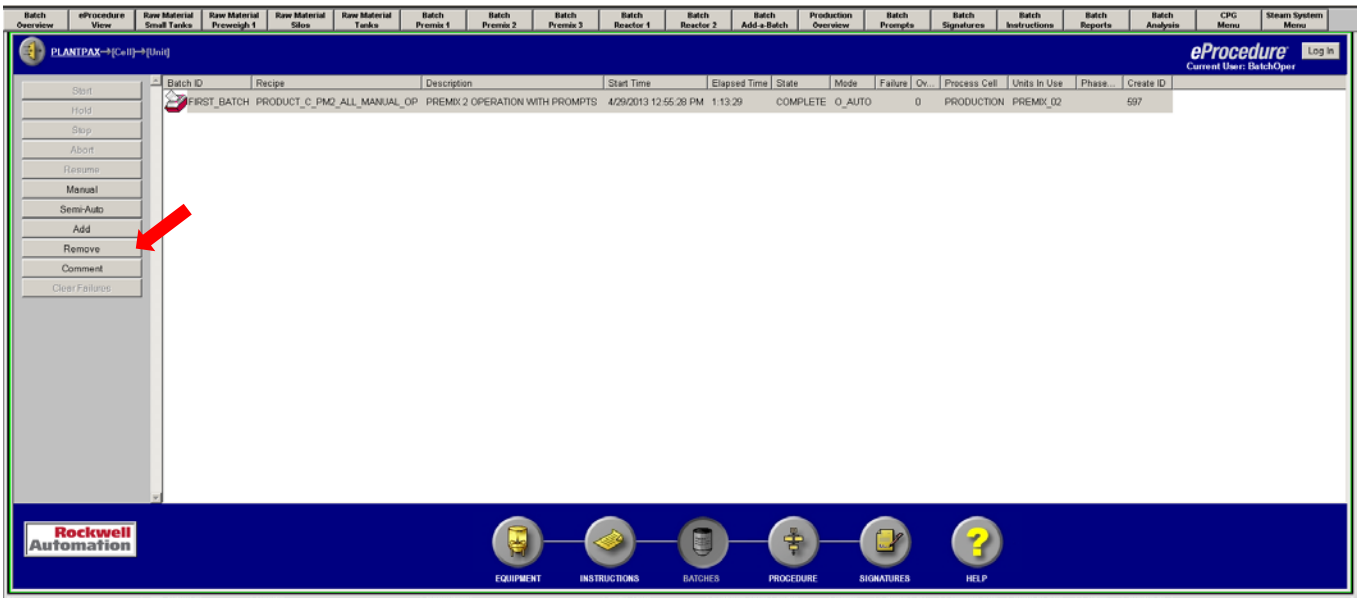


Step 12 Transfer the material to the tote.

The batch has completed, select the **Batches**

button to go to the batch list.

Lab 2: Factory Talk Batch
"eProcedure"



The electronic batch record has been created for the manufacturing of the First batch of product Product C. Select the ***Remove*** to remove the batch from the list.

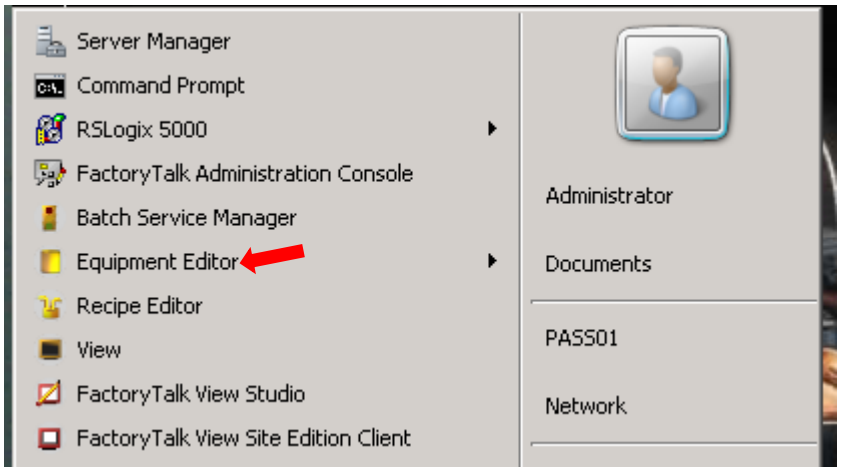
Lab 2: Factory Talk Batch "eProcedure"

Engineering aspect

Equipment Definition

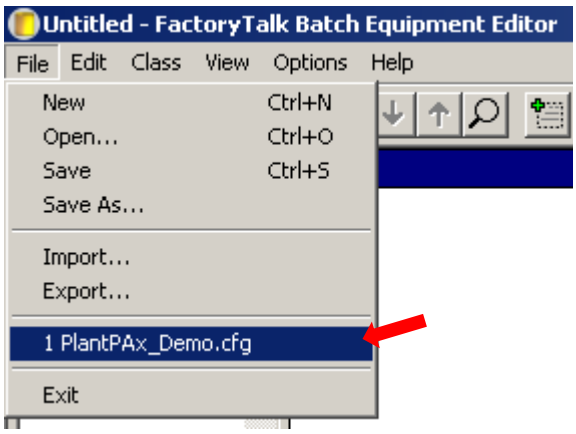
The equipment model of our process is what defines the capabilities or tasks that can be performed on the system, for Premix 2 these capabilities are going to be performed by the operator and not by the automation process equipment.

1. In order to view what those capabilities Start the FactoryTalk Batch Equipment Editor and open the Plant PAx equipment definition (CFG), This can be done using the Windows Start button and selecting ***Equipment Editor*** or the Equipment Editor icon on the Windows desktop



Lab 2: Factory Talk Batch "eProcedure"

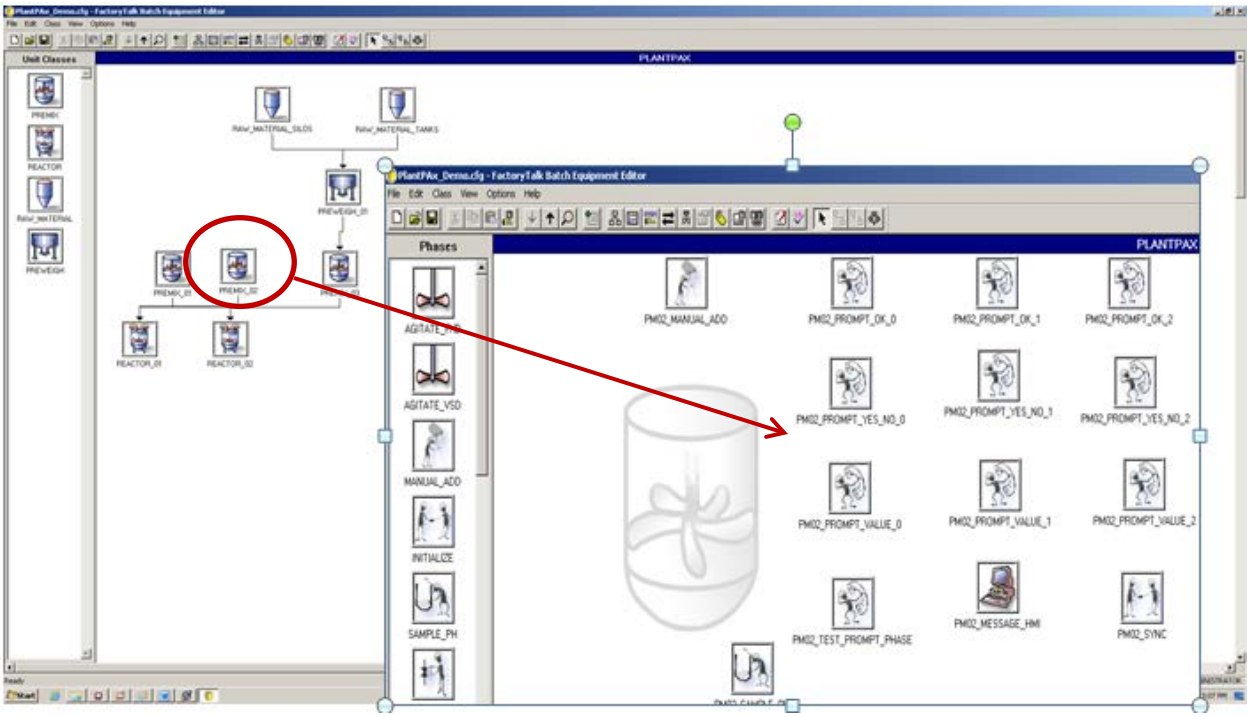
2. From the Equipment Editor select ***File->PlantPAx_Demo.cfg***



3. Navigate to the Premix 2 unit to view the phases defined in it.

   A set of Generic Prompt instructions has been created in the Batch Equipment Editor as seen in the following screen; these generic phases are typically applied to every unit.

   These phases do not require a Controller and do not require an HMI, but can be an integral component of a semi-automated system.



For this unit a set of generic phase classes have been defined:

Lab 2: Factory Talk Batch "eProcedure"

- Generic **Prompt to acknowledge** with 0, 1, or 2 passwords required to complete the phase.

PM02_PROMPT_OK_0

PM02_PROMPT_OK_1

PM02_PROMPT_OK_2

- Generic **Prompt Yes or No** with 0, 1, or 2 passwords required to complete the phase.

PM02_PROMPT_YES_NO_0

PM02_PROMPT_YES_NO_1

PM02_PROMPT_YES_NO_2

- Generic **Prompt Value** with 0, 1, or 2 passwords required to complete the phase.

PM02_PROMPT_VALUE_0

PM02_PROMPT_VALUE_1

PM02_PROMPT_VALUE_2

- Manual material adds.

PM02_MANUAL_ADD

- Sample pH

PM02_SAMPLE_PH

- Synchronize phase

PM02_SYNC (used to coordinate activities with other units)

Lab 2: Factory Talk Batch "eProcedure"

Generic phases consist of a web page that can display configured text, Images and videos that will be displayed to operators.
The operator will follow the instructions and acknowledge them as required.

The set of generic prompt phases contain 3 types of prompts:

- One type where the operator needs to confirm an instruction.
- One requiring the operator to enter a value.
- One requiring answering Yes or No.

In order to confirm and complete the instruction the phase may require no signature, one operator signature or an Operator and a Supervisor signature.

Lab 2: Factory Talk Batch "eProcedure"

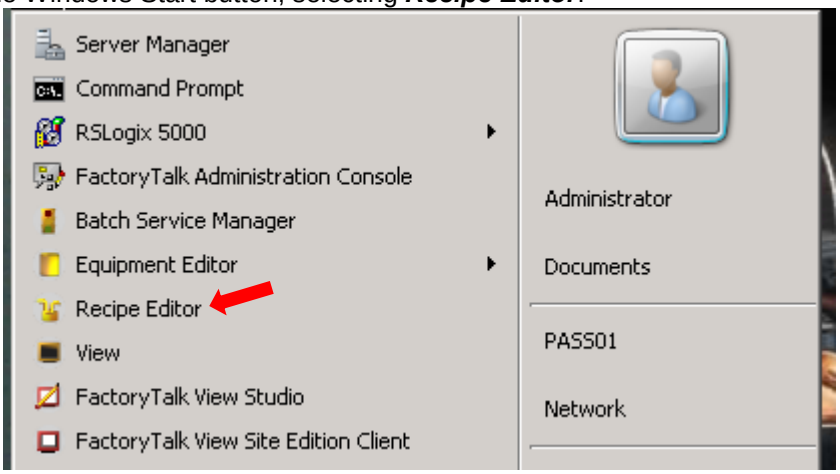
Procedure Definition

Formulator aspects.

Creating an electronic SOP may be achieved with the use of generic phases; if specific instructions are required new phases can be created.

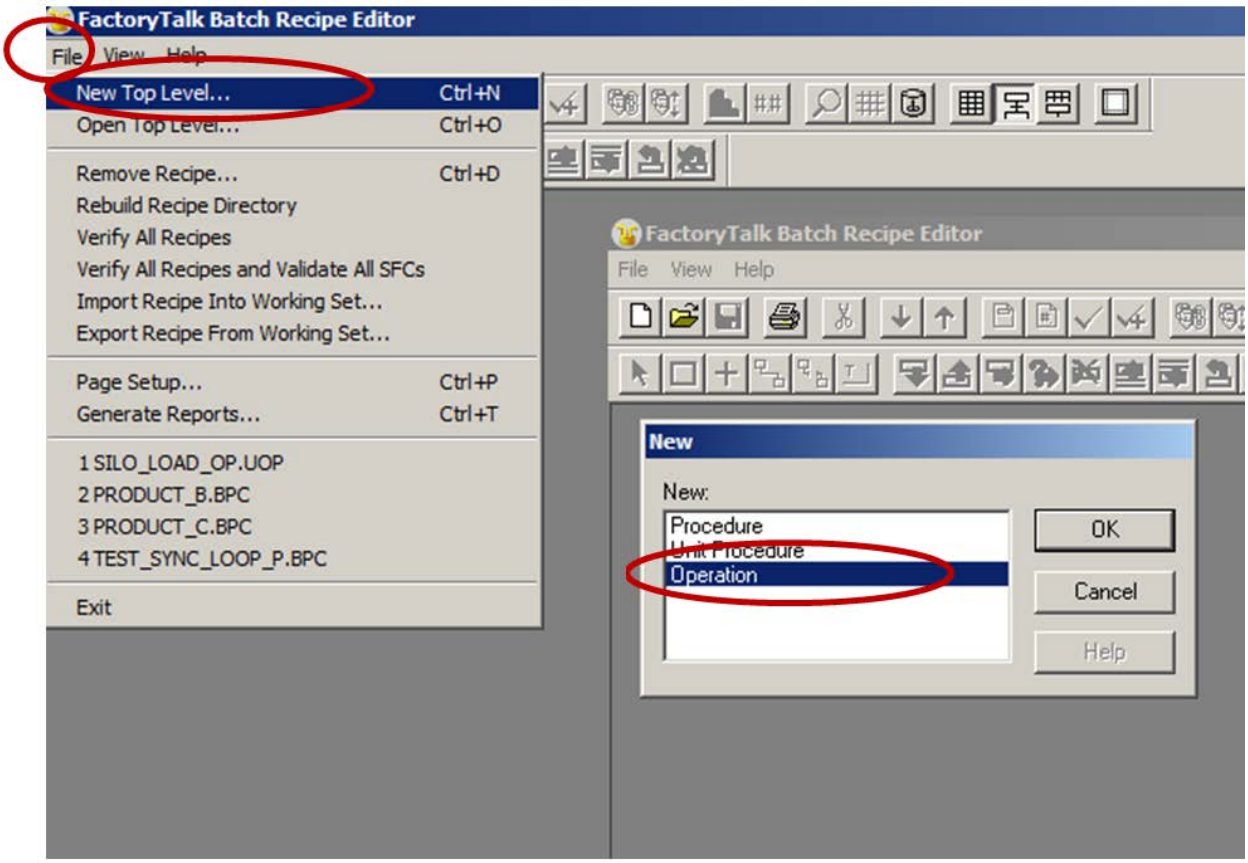
The Recipe Editor is used to create procedures, open the Recipe Editor by double-clicking its icon

on the desktop or through the Windows Start button, selecting ***Recipe Editor***.



Lab 2: Factory Talk Batch "eProcedure"

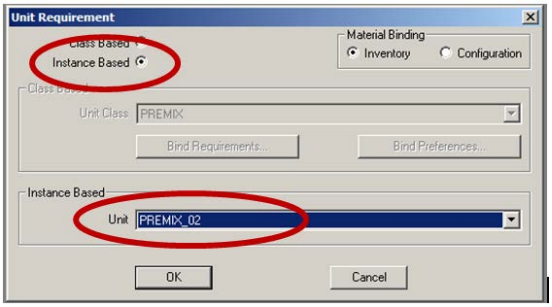
1. Create a new operation level recipe; this will be for a new product Product_XYZ.



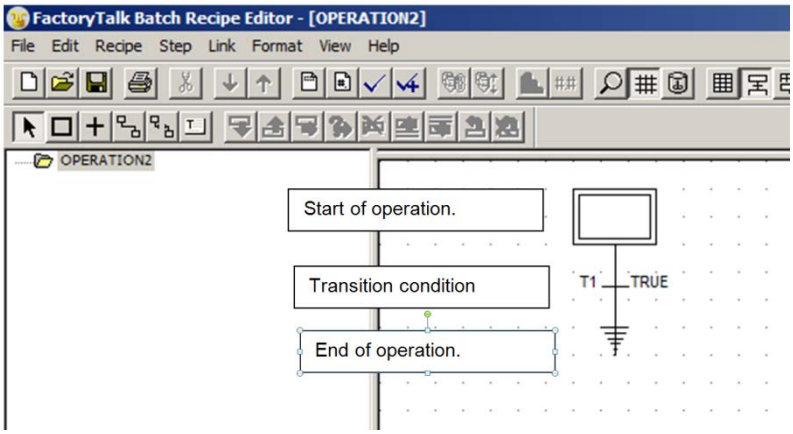
Recipes can be assigned to a specific unit or can be specified to run on a class of unit.
If the process contains 10 premix units and they can all make a product, only one recipe needs to be built, this recipe is then read by the batch server and can run on any and all of the units at the same time.
These recipes are called "Class Based" recipes.

Lab 2: Factory Talk Batch "eProcedure"

2. For this lab we will build a recipe that can only run in premix 02. Select ***Instance Based*** in order to create an operation that can only run in **PREMIX_2**, then select ***OK***



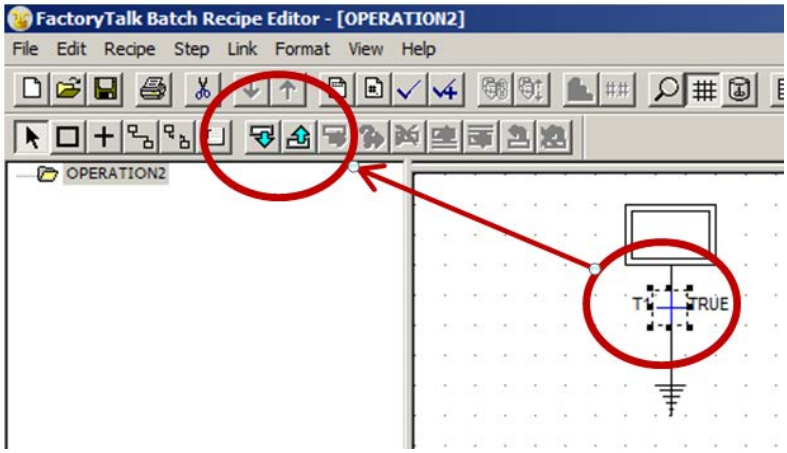
The following display provides us with a recipe that has no steps, it consist of a start point and an end point and a transition condition.



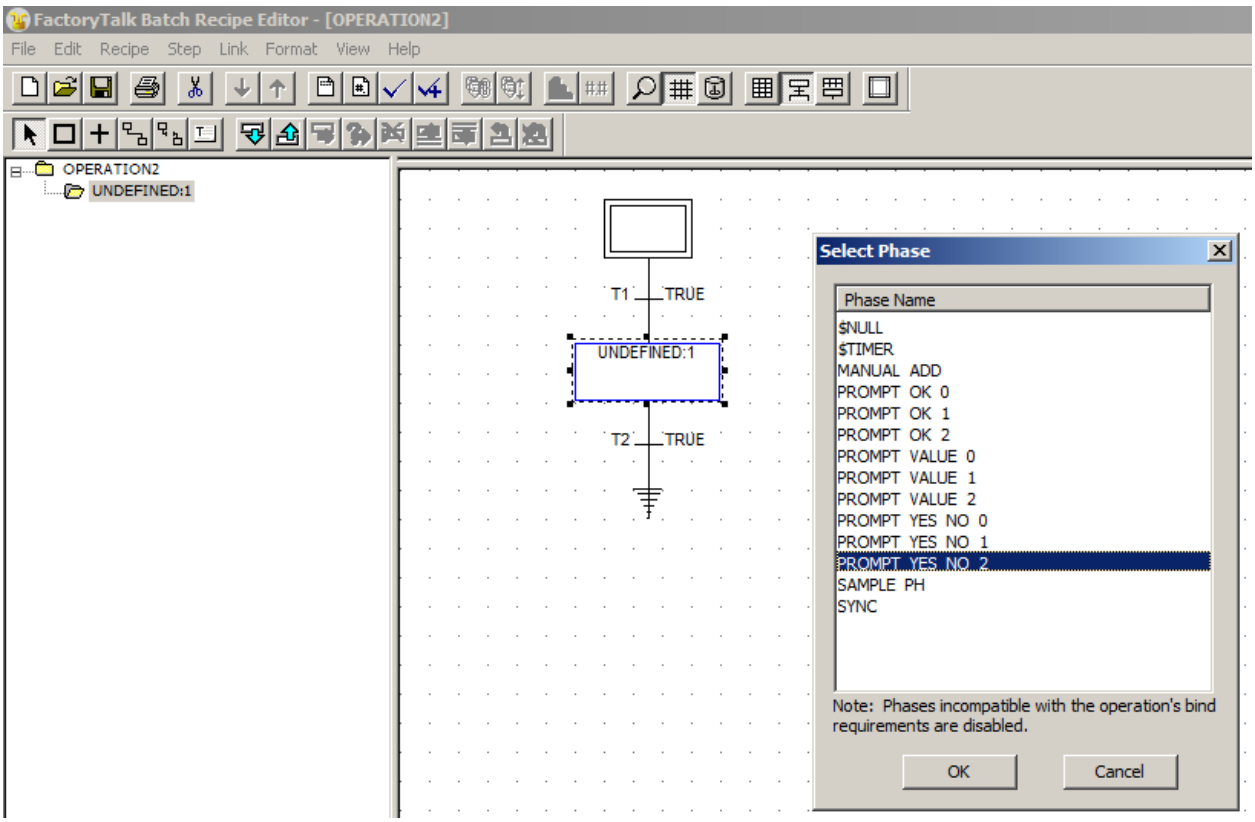
In order to start adding the steps of the SOP we start by adding a prompt that requires 2 signatures, we would prompt the operator and supervisor to answer if the reactor is clean?
If the premix is clean the recipe will continue to the next step, if the premix is not clean the operator will be instructed to clean the premix
Once he acknowledges that it has been cleaned step one will be repeated.

3. Before inserting this step, select the location the step is to be inserted into. Add a phase use the blue arrows on the top of the editor tool bar.

Lab 2: Factory Talk Batch
"eProcedure"



An undefined phase is inserted; a selection box shows the possible phases to be inserted.

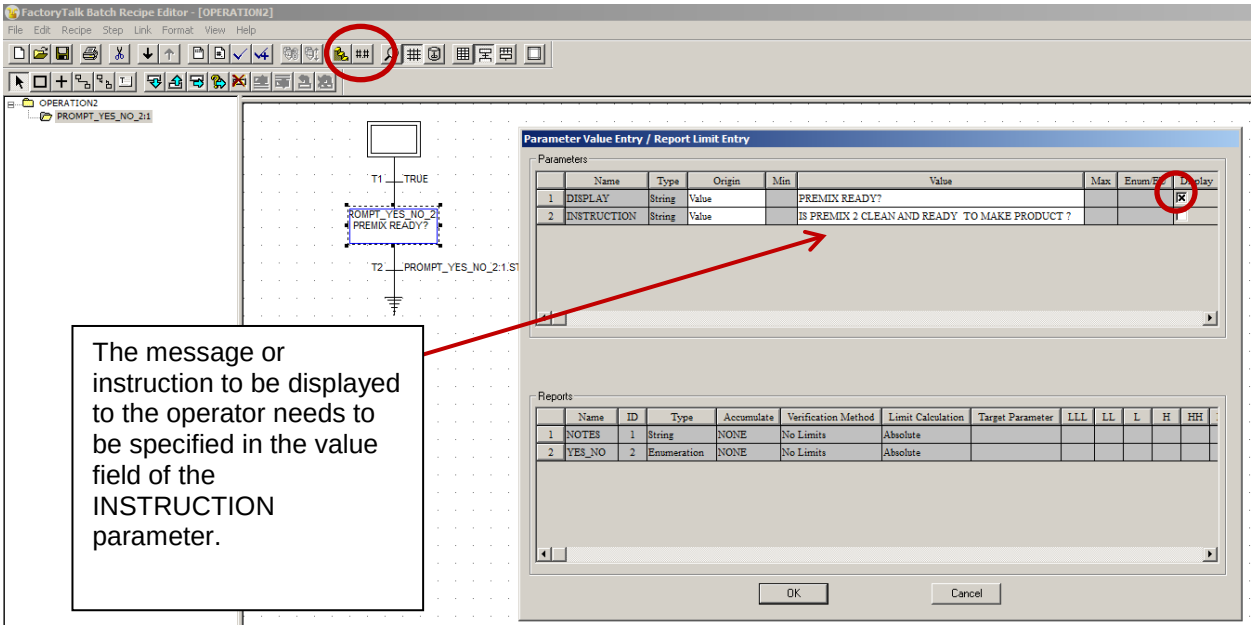


Lab 2: Factory Talk Batch "eProcedure"

4. Select the ***PROMPT_YES_NO_2*** phase that requires 2 passwords

Configuring Formula Values

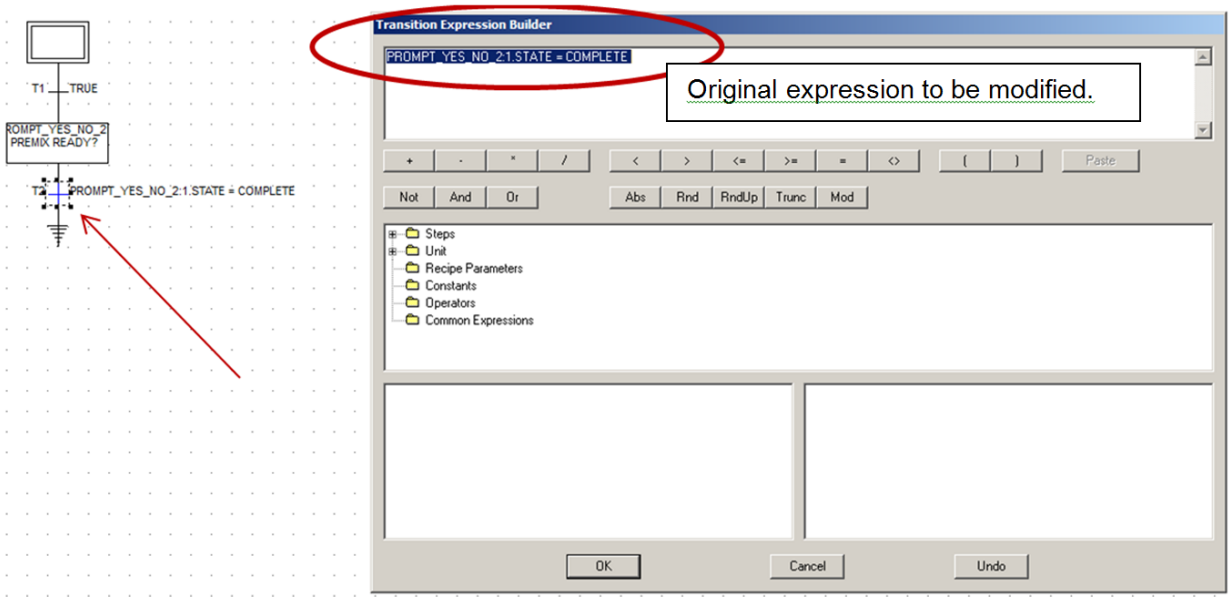
5. Select the parameter configuration button in order to fill out the values to be used for this phase instance.



Lab 2: Factory Talk Batch "eProcedure"

Configuring the transition conditions

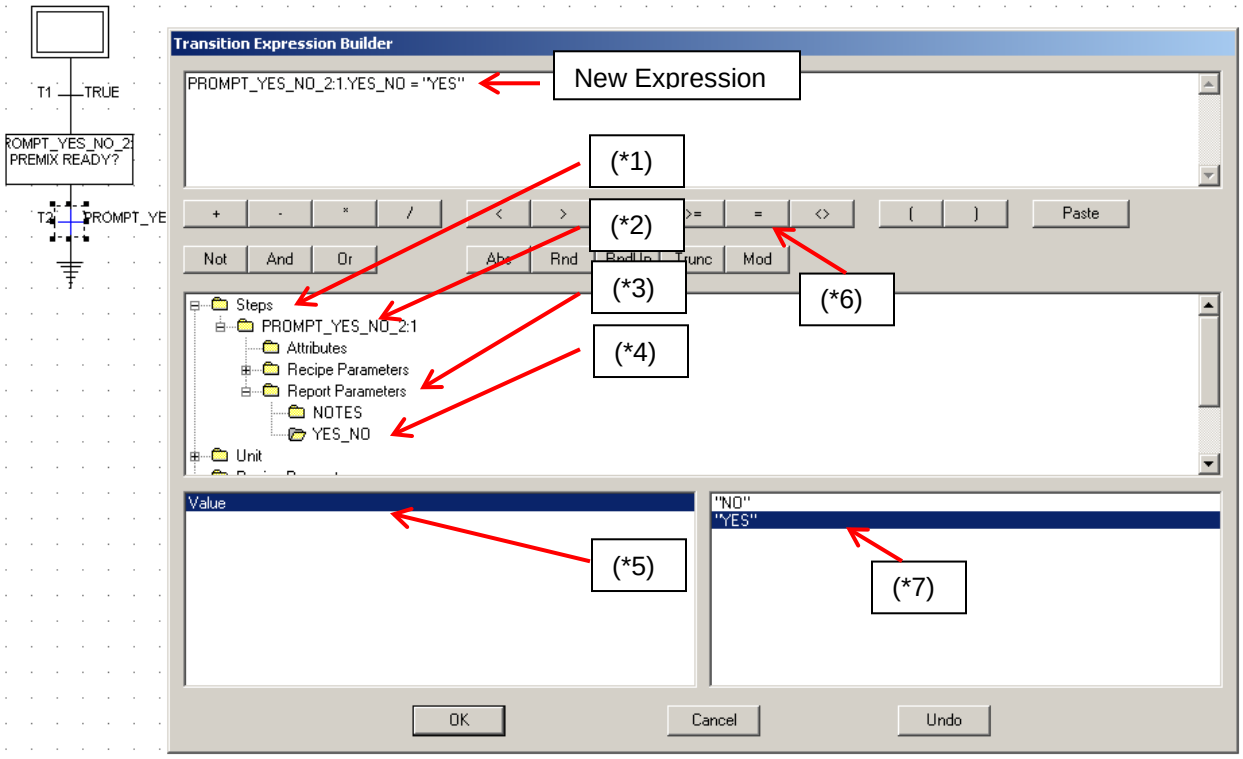
Double click the transition labeled T2 to open and edit the expression for this transition.



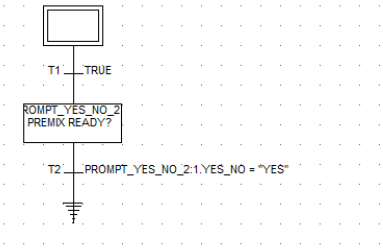
Lab 2: Factory Talk Batch "eProcedure"

6. At this point we wish to evaluate the operator's response to the prompt in order to take the required actions.

(*1) Go to the expression tree to open the Steps folder
(*2) Locate the phase instance
(*3) Expand the report parameters
(*4) Select the "YES_NO".
(*5) At this point double click the "value" field to insert the report parameter into the expression field
(*6) Follow it with an "="
(*7) Then double click the "YES"



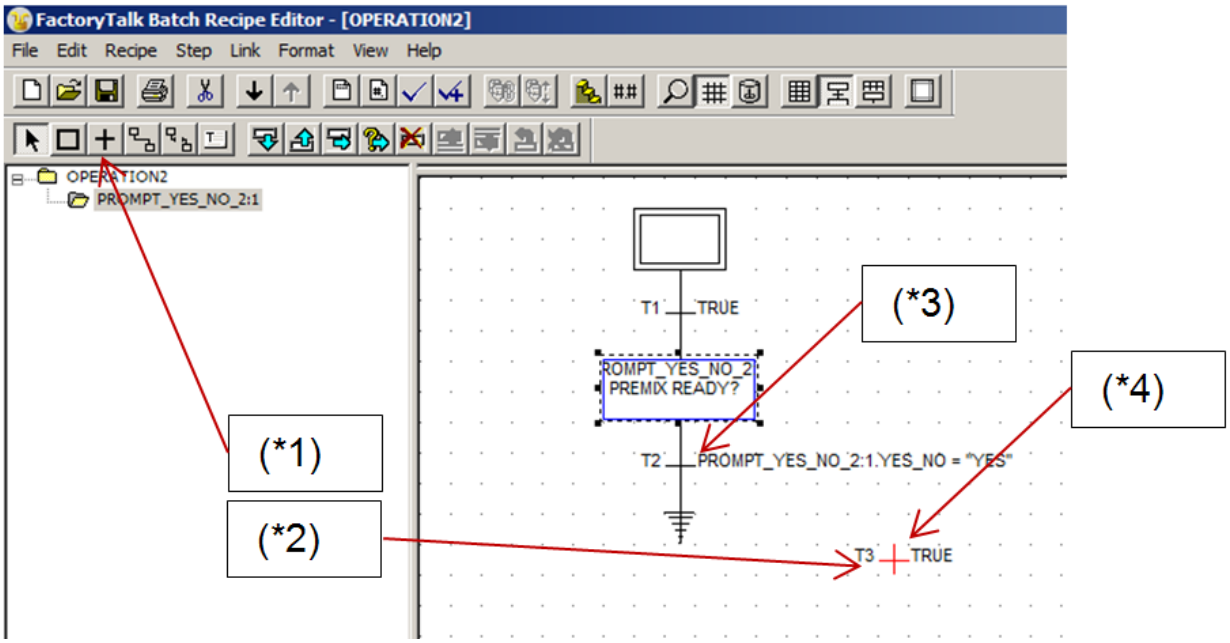
7. Your transition expression has been built, select ***OK*** to close.



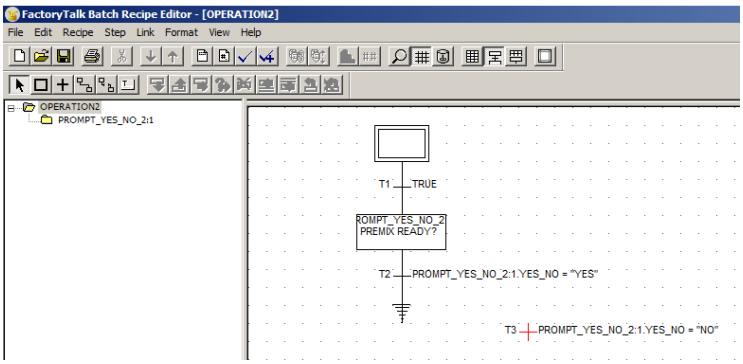
At this point we have only evaluated if the operators response was yes.

8. Let's now create the expression and action for the "NO" response.

(*1) Add a new transition to the recipe by selecting the ***Transition Tool***.
(*2) and clicking on the recipe
(*3) Double click transition "T2" open and copy the previously built expression,
(*4) Double click T3 to open then paste the expression and change the "YES" to a "NO".



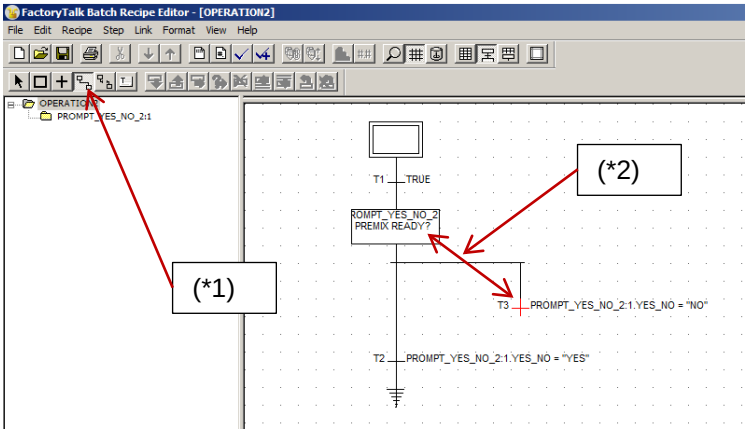
Lab 2: Factory Talk Batch "eProcedure"



Defining the recipe flow

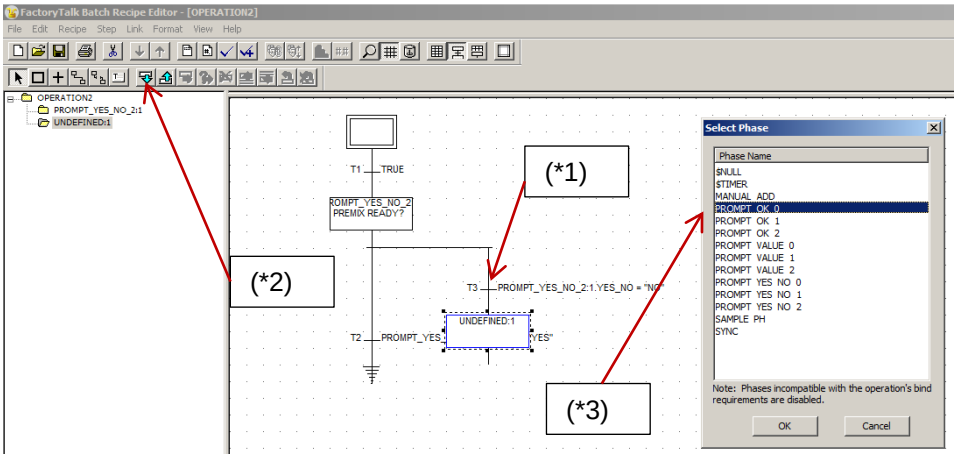
9. Now, let's add a new phase to prompt the operator to clean the tank and loop back to the Premix Ready step.

   (*1) Select the connection button and
   (*2) Click and drag the link from the premix ready step to T3



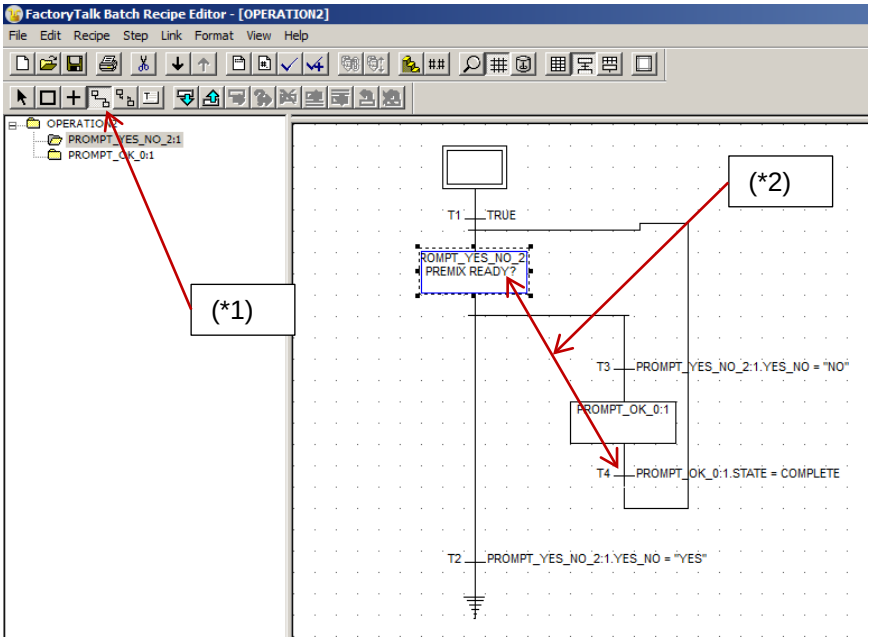
Lab 2: Factory Talk Batch "eProcedure"

10. Add the ***Prompts_OK_0*** phase to the operation.
    (*1) Select ***T3***
    (*2) Insert a step
    (*3) Select "***PROMPT_OK_0***"



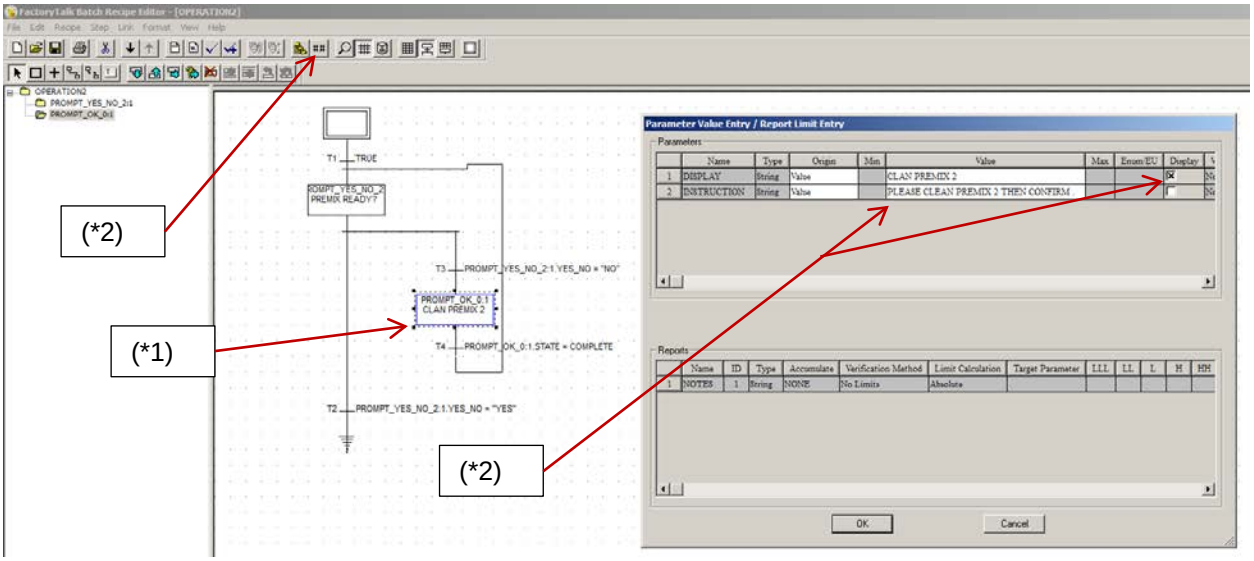
11. Make the required connections.

    (*1) Select the connection button and
    (*2) Click and drag the link from T4 to the Premix Ready step.



Lab 2: Factory Talk Batch "eProcedure"

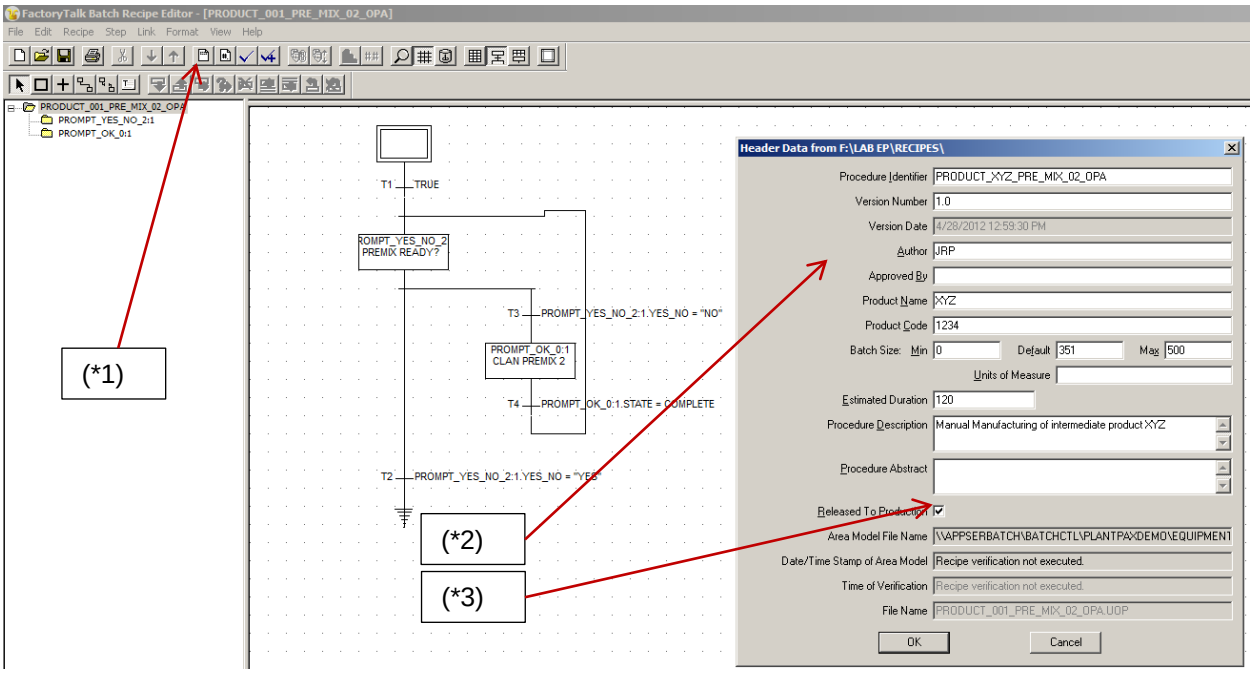
12. Now add the instruction to be displayed to the operator on step Promp_OK_0:1
    (*1) Select phase instance
    (*2) Select the ***Parameter Configuration*** button
    (*3) Fill in the parameter values as shown.



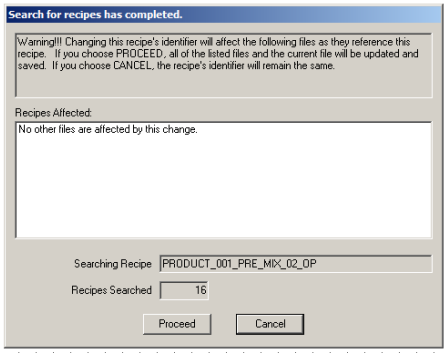
Lab 2: Factory Talk Batch "eProcedure"

Fill out the recipe Header data, this identifies and provides recipe information.

(*1) Select the Header data button
(*2) Fill out the required fields
(*3) The release to production needs to be checked in order to be able to run this recipe. Select ***OK***



The editor will check to inform you if any other recipes will be affected by this operation being renamed. Select the ***Proceed*** button, then the ***OK*** button.

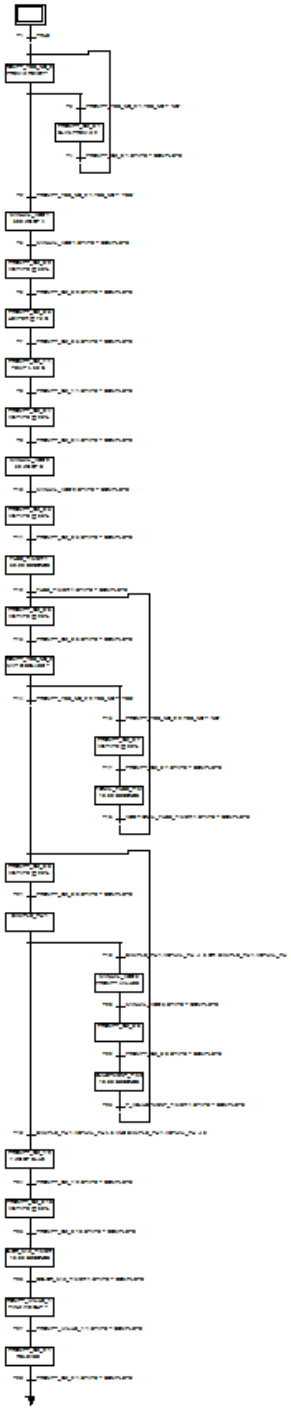


You have created one of the steps for making Product XYZ. This step of the recipe can now be run.

Lab 2: Factory Talk Batch "eProcedure"

Recipe overview

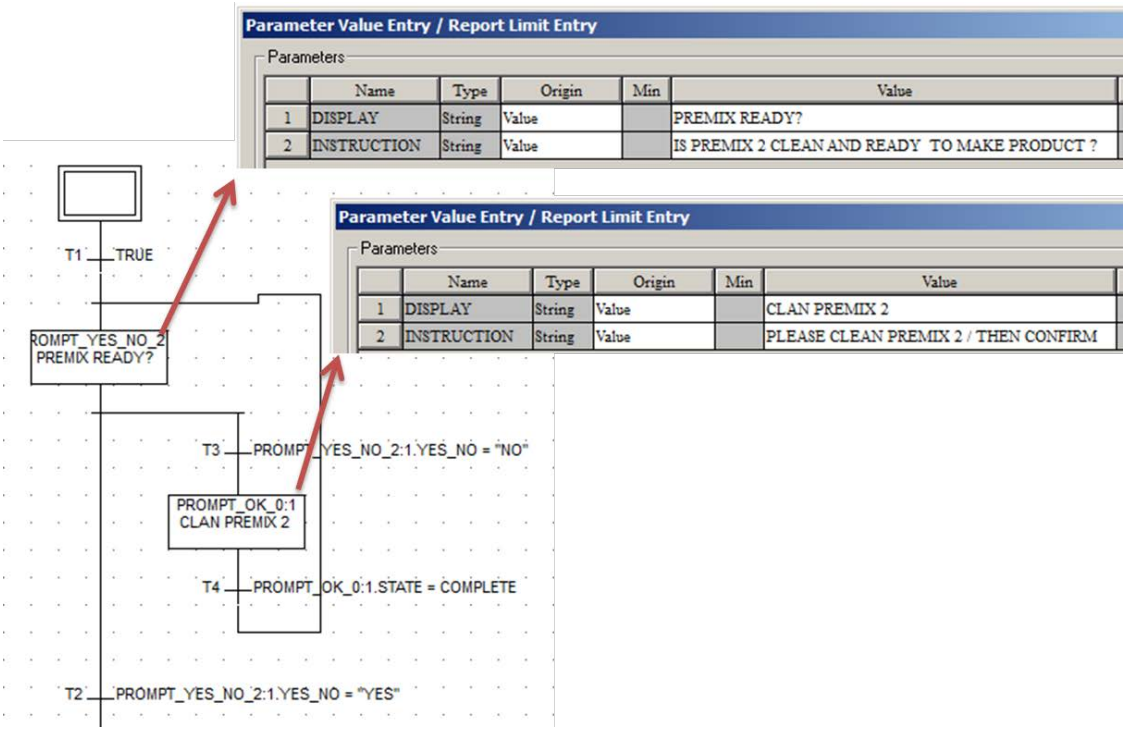
The following diagram shows the completed electronic work instruction for the Manual manufacturing of recipe XYZ; we will take a closer look at this recipe.



Lab 2: Factory Talk Batch "eProcedure"

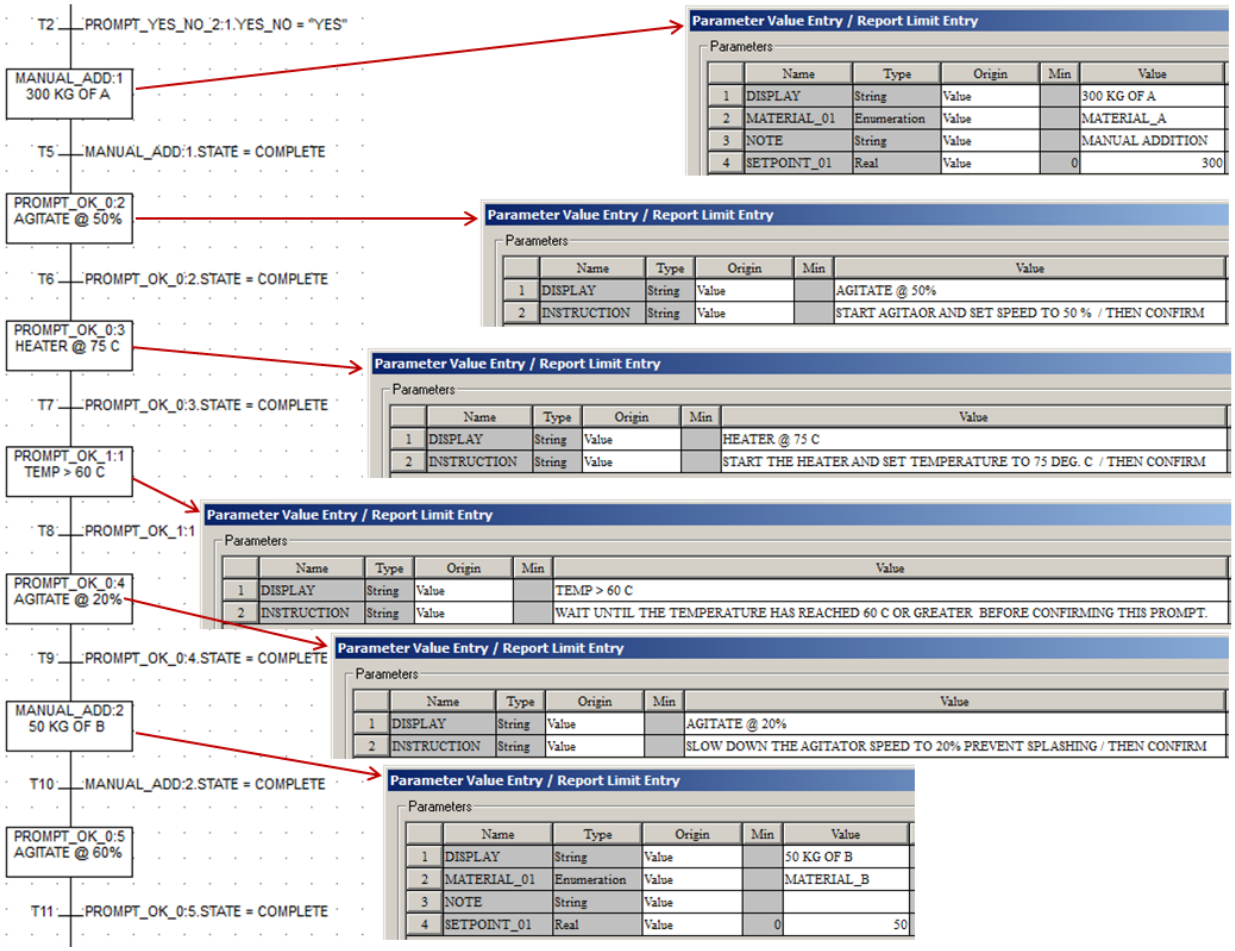
Recipe Details

Recipe XYZ Step 1



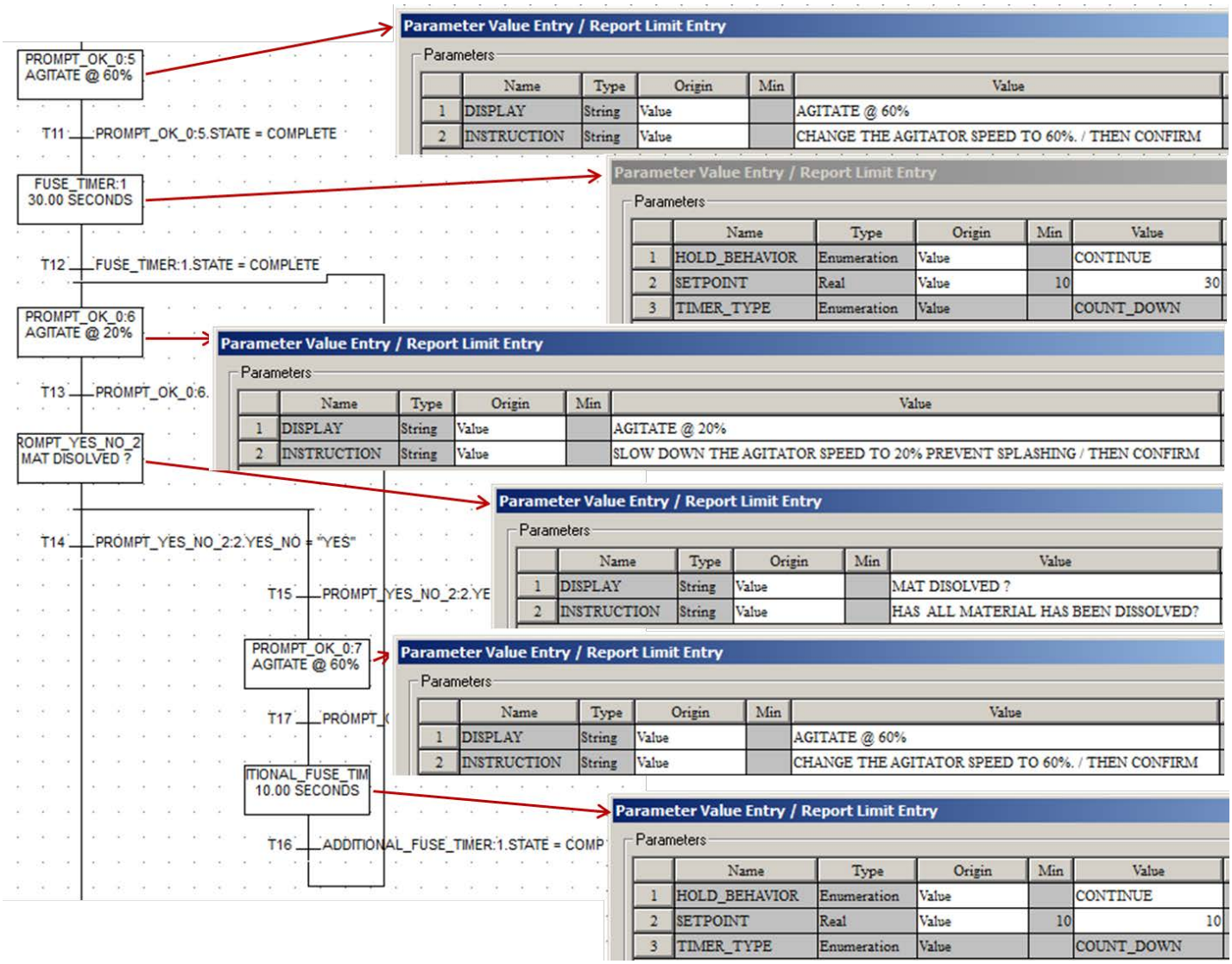
Lab 2: Factory Talk Batch "eProcedure"

Recipe XYZ Step 2 – 7



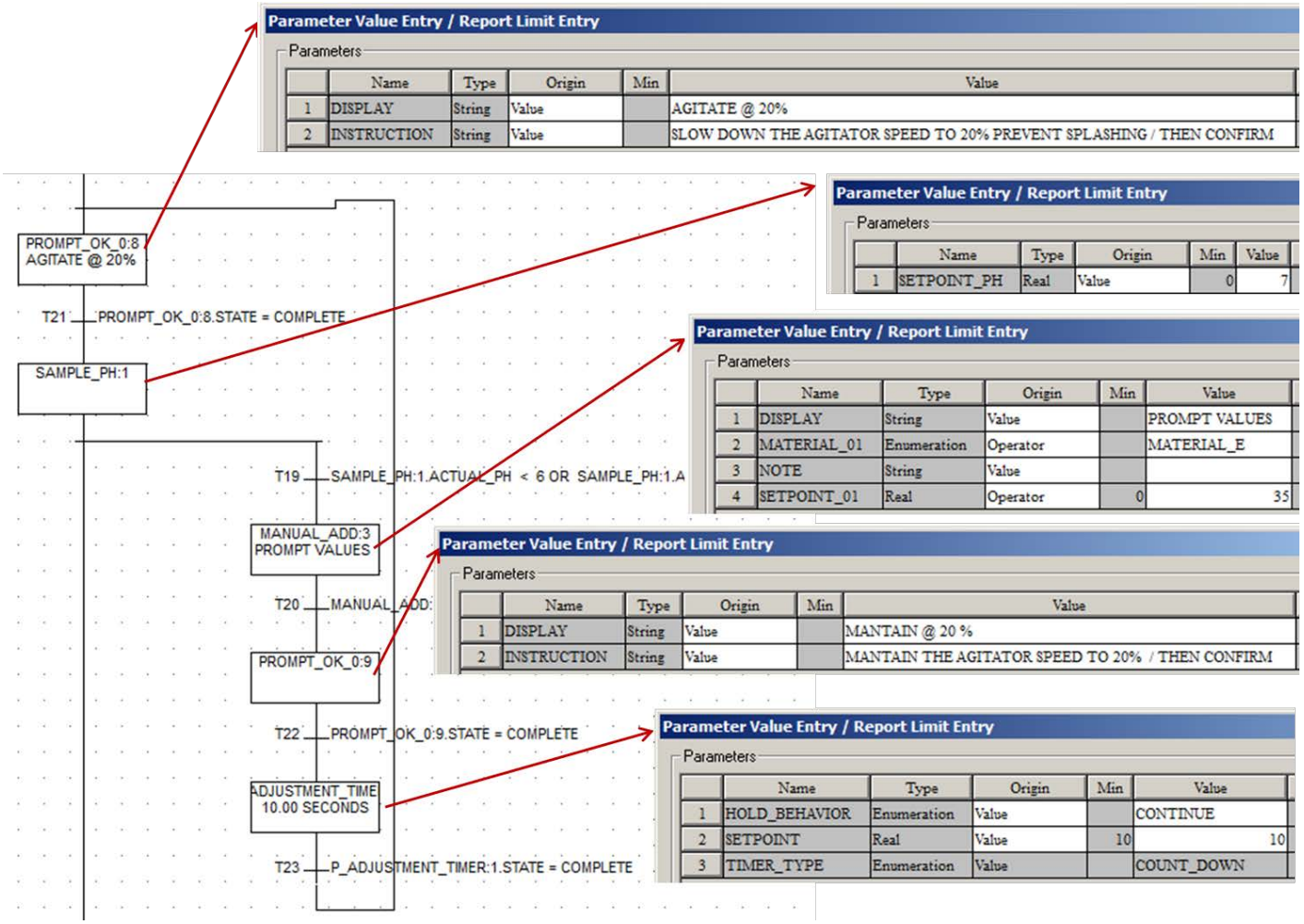
Lab 2: Factory Talk Batch
"eProcedure"

Recipe XYZ Step 8 - 11



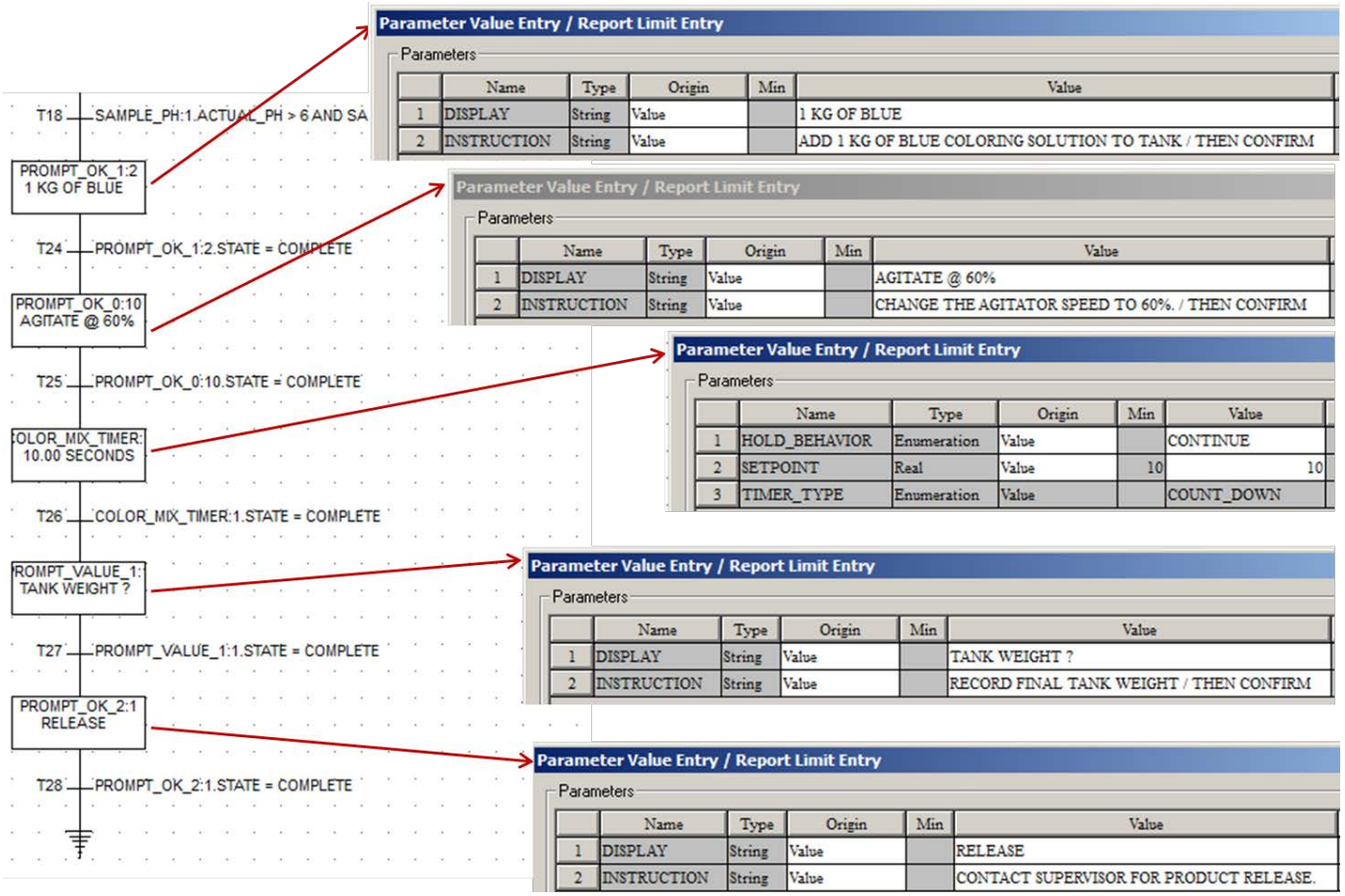
Lab 2: Factory Talk Batch
“eProcedure”

Recipe XYZ Step 12 – 13



Lab 2: Factory Talk Batch
"eProcedure"

Recipe XYZ Step 14 – x

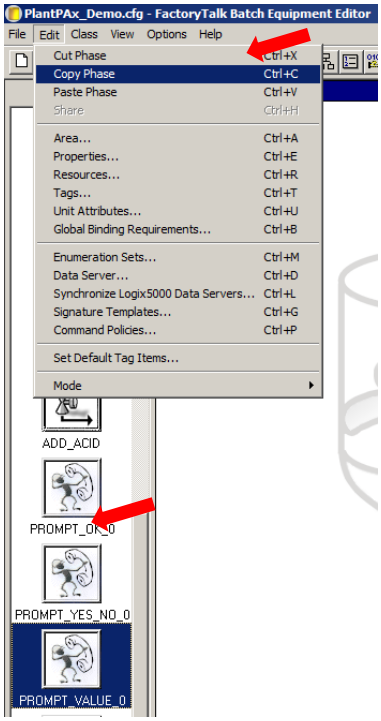


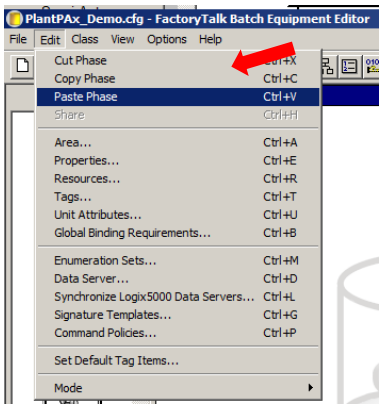
Lab 2: Factory Talk Batch "eProcedure"

Creating an eProcedure instruction:

Let use an existent instruction and modify it to show how to set up an eProcedure Phase.

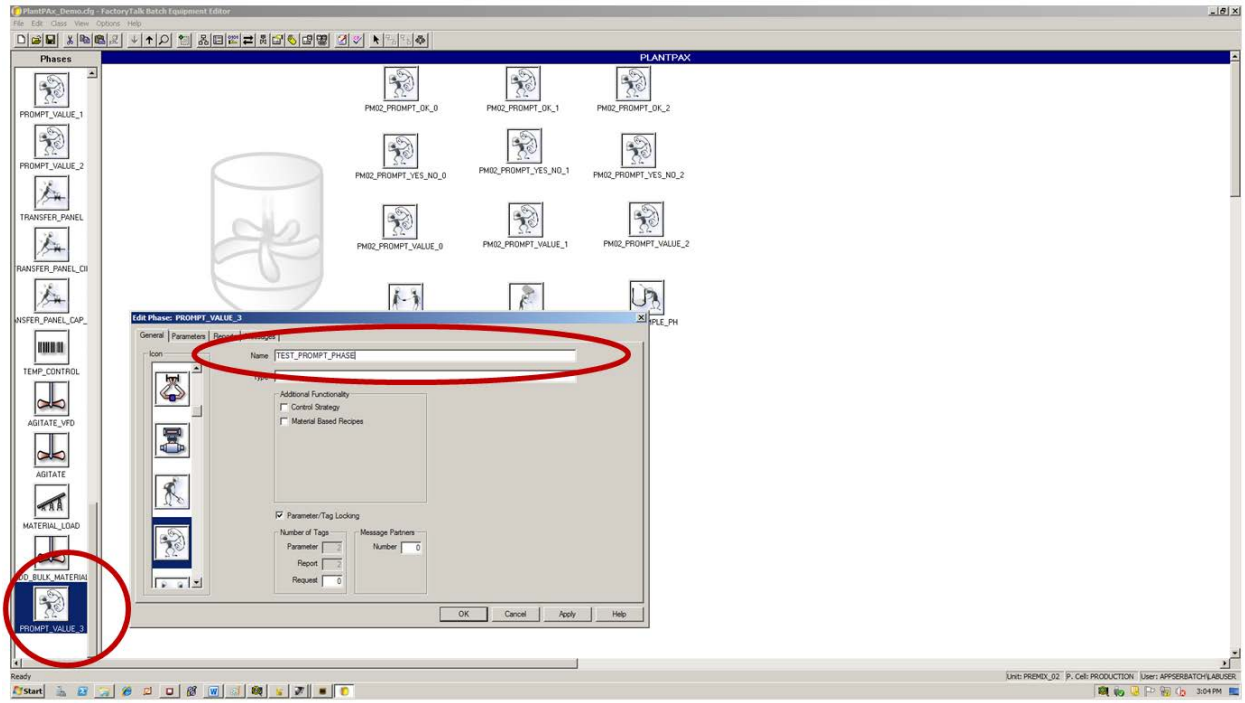
1. Start by Defining the Phase Class in the equipment editor. Copy and paste **PROMPT_VALUE_0**.



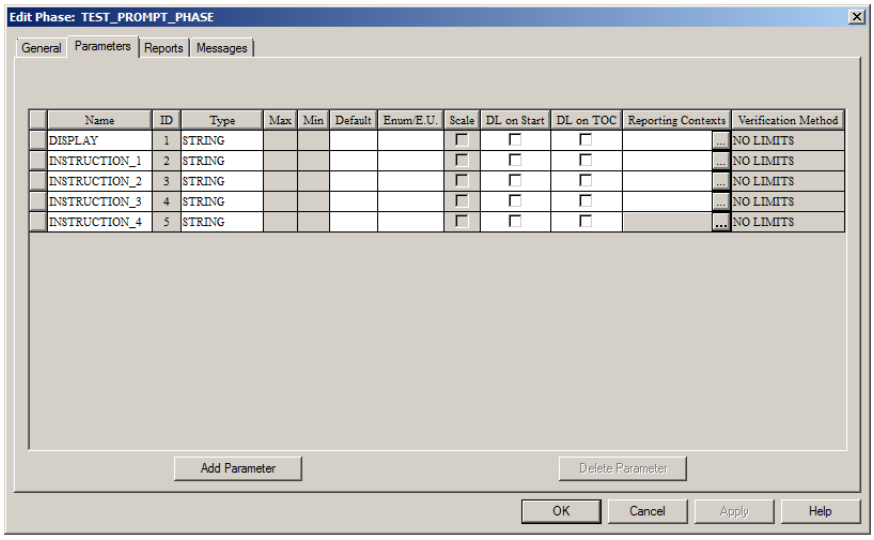


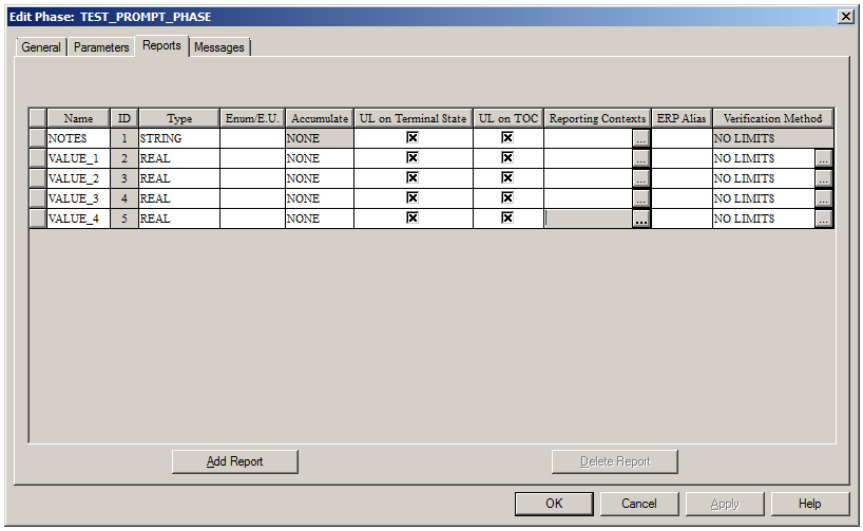
Lab 2: Factory Talk Batch
“eProcedure”

The new phase will be at the bottom of the Phase Class list.
Rename the new class “**TEST_PROMPT_PHASE**”



2. Configure the new phase parameter values and reports as per the following displays.





3. Select ***OK*** when done.

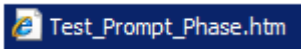
We have defined the phase class.

Lab 2: Factory Talk Batch "eProcedure"

Now let's define the instruction that will be displayed when this phase is run.

1. Switch to the **AppSerBatch** and from Windows Explorer drill down to **C:\Program Files (x86)\Rockwell Software\Batch\PlantPAxDemo\Instructions**.

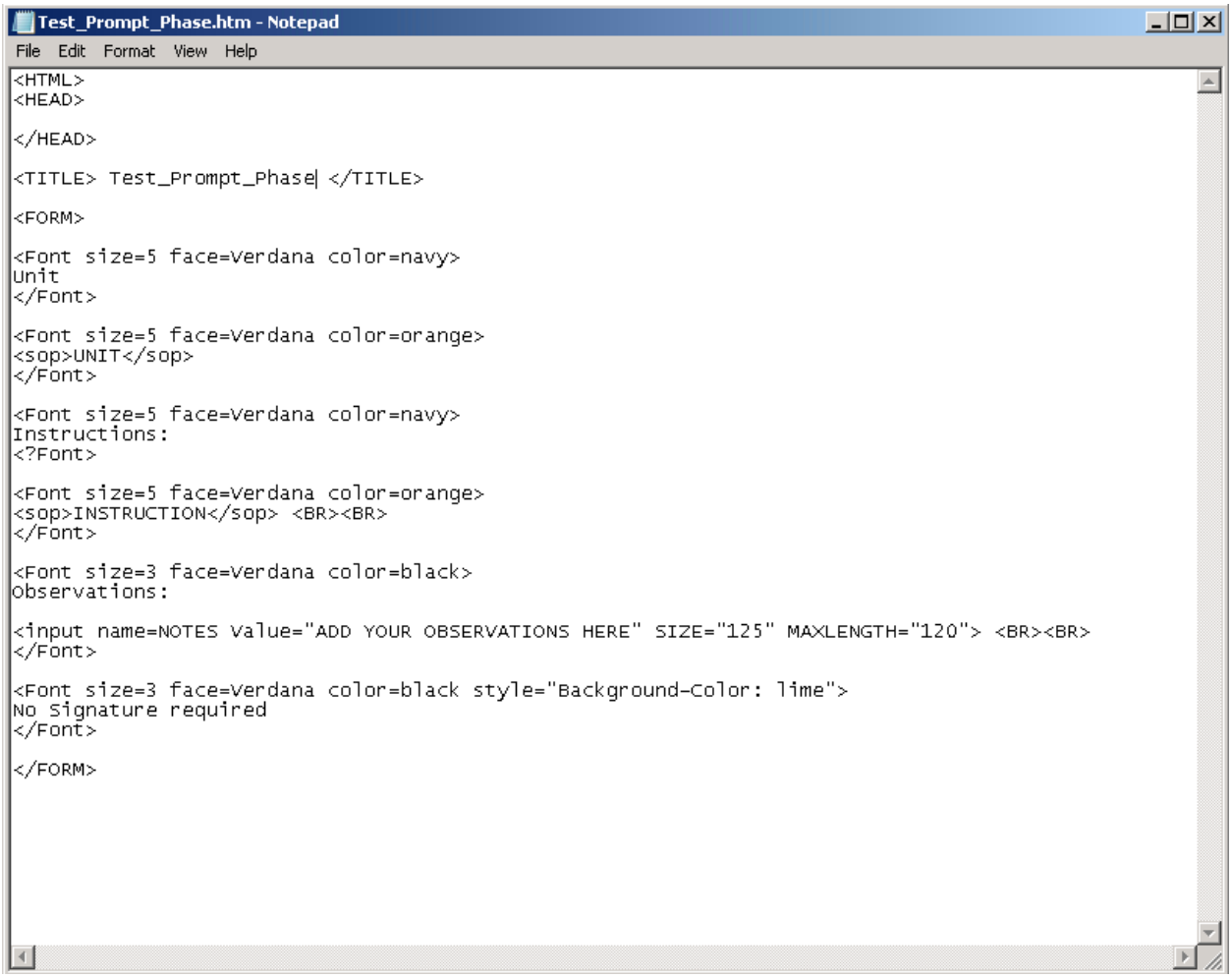
2. Copy and paste the instruction file

and rename it 

.

Instructions can be edited using different tools, such as 'FrontPage' or 'Word', but a text editor like Notepad will work just fine. We will use Notepad to do our editing.

3. Open Notepad using the Windows Start button and drill down to the folder from step 1 and select ***Test_Prompt_Phase.htm***.



4. Edit the file to match the parameters and reports defined in the phase class. The file should look like this when done. Save the file. The screen capture shows up to 'INSTRUCTION_2' and 'VALUE_2' add two more copies of these lines. There is a completed phase you can use, if you don't want to do all the editing, "***Test_Prompt_Phase_Complete.htm***".

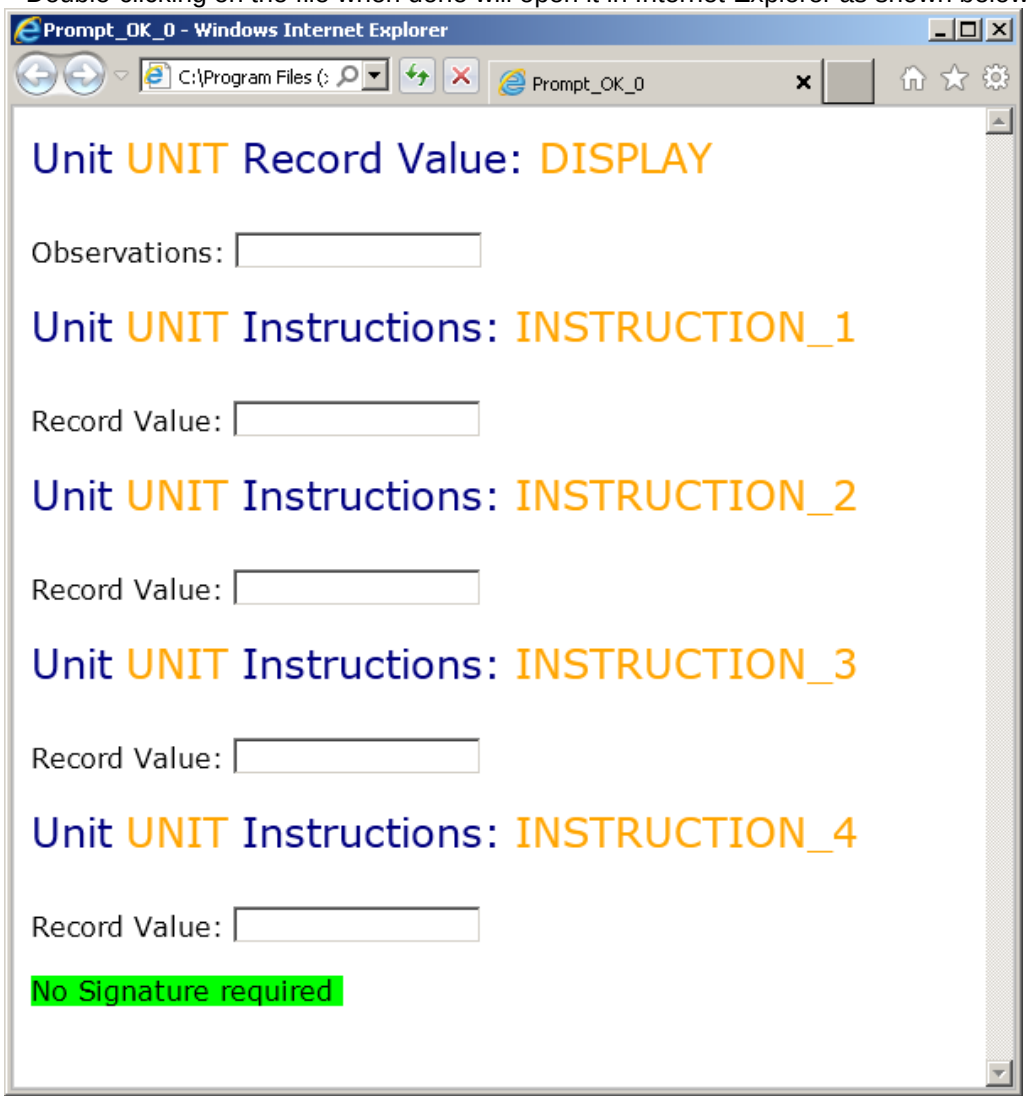
Lab 2: Factory Talk Batch
"eProcedure"

Test_Prompt_Phase.htm - Notepad

File Edit Format View Help

```
<HTML>
<HEAD>

</HEAD>

<TITLE> Test Prompt   /TITLE>

<FORM>

<Font size=5 face=Verdana color=navy>
Unit
</Font>

<Font size=5 face=Verdana color=orange>
<sop>UNIT</sop>
</Font>

<Font size=5 face=Verdana color=navy>
Record Value:
<?Font>

<Font size=5 face=Verdana color=orange>
<sop>DISPLAY</sop> <BR><BR>
</Font>

<Font size=3 face=Verdana color=black>
Observations:

<input name=NOTES  SIZE="20" MAXLENGTH="20"> <BR><BR>
</Font>


<Font size=5 face=Verdana color=navy>
Unit
</Font>

<Font size=5 face=Verdana color=orange>
<sop>UNIT</sop>
</Font>

<Font size=5 face=Verdana color=navy>
Instructions:
<?Font>

<Font size=5 face=Verdana color=orange>
<sop>INSTRUCTION_1</sop> <BR><BR>
</Font>

<Font size=3 face=Verdana color=black>
Record Value:

<input name=VALUE_1  SIZE="20" MAXLENGTH="20"> <BR><BR>
</Font>


<Font size=5 face=Verdana color=navy>
Unit
</Font>

<Font size=5 face=Verdana color=orange>
<sop>UNIT</sop>
</Font>

<Font size=5 face=Verdana color=navy>
Instructions:
<?Font>

<Font size=5 face=Verdana color=orange>
<sop>INSTRUCTION_2</sop> <BR><BR>
</Font>

<Font size=3 face=Verdana color=black>
Record Value:

<input name=VALUE_2  SIZE="20" MAXLENGTH="20"> <BR><BR>
</Font>

<Font size=5 face=Verdana color=navy>
Unit
</Font>

<Font size=5 face=Verdana color=orange>
<sop>UNIT</sop>
```

5. Double-clicking on the file when done will open it in Internet Explorer as shown below.



Note: The value of the parameters will be displayed in the field with the parameter names, shown above in orange the values entered in the text boxes will be captured as reports of the phase.

Now let's add an instance of this phase class to the unit.

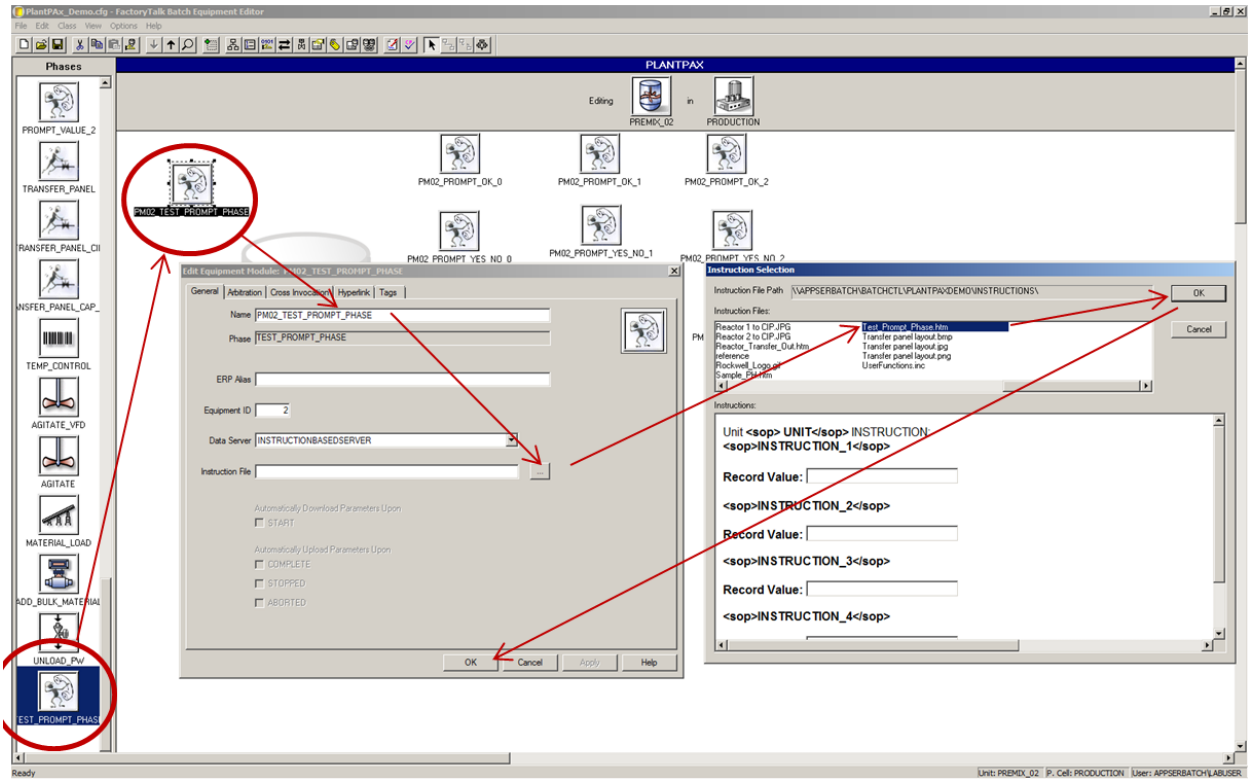
1. Go to the Equipment Editor and open the ***Premix_02*** unit.

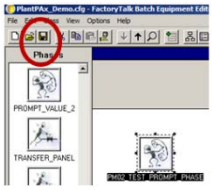
2. Select the phase class ***TEST_PROMPT_PHASE*** then click the unit (white area displaying the phases). A configuration popup will allow you to name this phase instance, NAME it "**PM02_Test_Prompt_Phase**" as shown in the picture.

   The data server for this phase will be set for "INSTRUCTIONBASEDSERVER"

Lab 2: Factory Talk Batch "eProcedure"

3. Select the Instruction File by selecting the selection box. Once the Instruction Selection opens, select the instruction ***Test_Prompt_Phase.*htm** file. Select ***OK*** to close dialogue boxes.

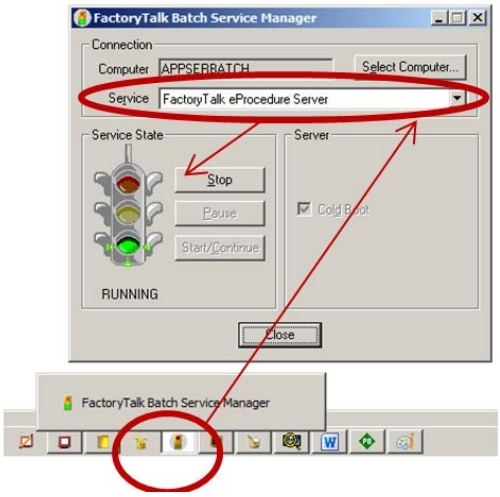


4. Save your work. 

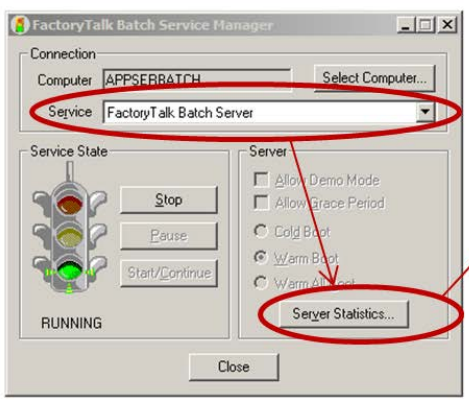
This phase is now ready to be used in a recipe.

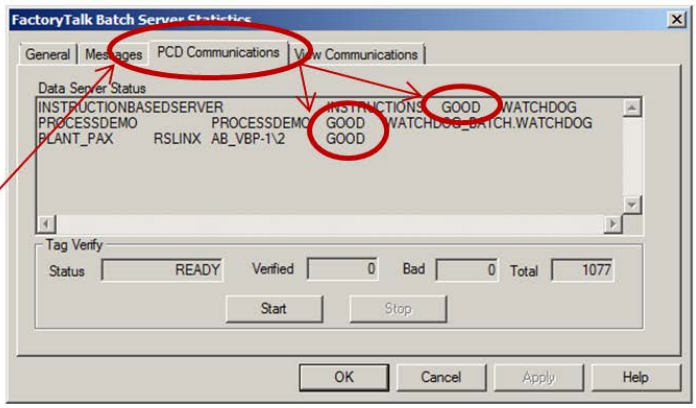
Lab 2: Factory Talk Batch "eProcedure"

Stop the eProcedure and Batch service so the new configuration can be read upon restarting.



Once these services have been stopped restart them.



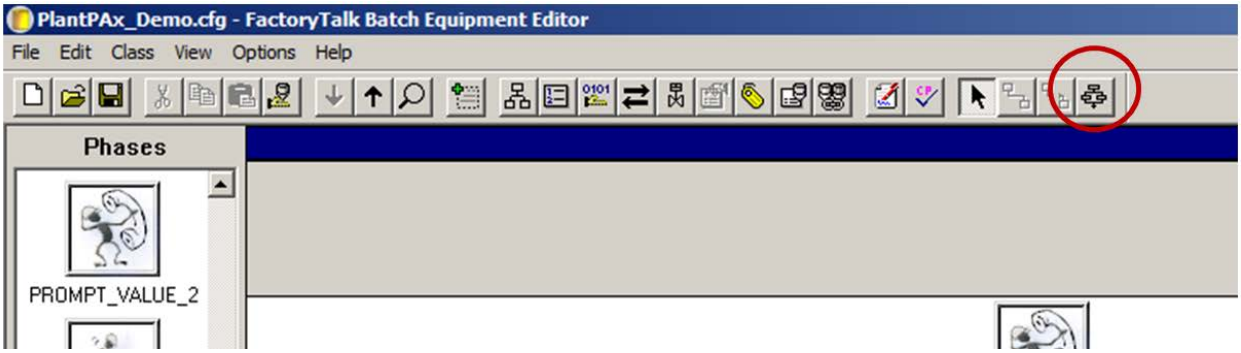


To confirm that the data servers are working properly, select the **Server statistics** button then the **PCD Communication** tab, confirm all services have a GOOD status.

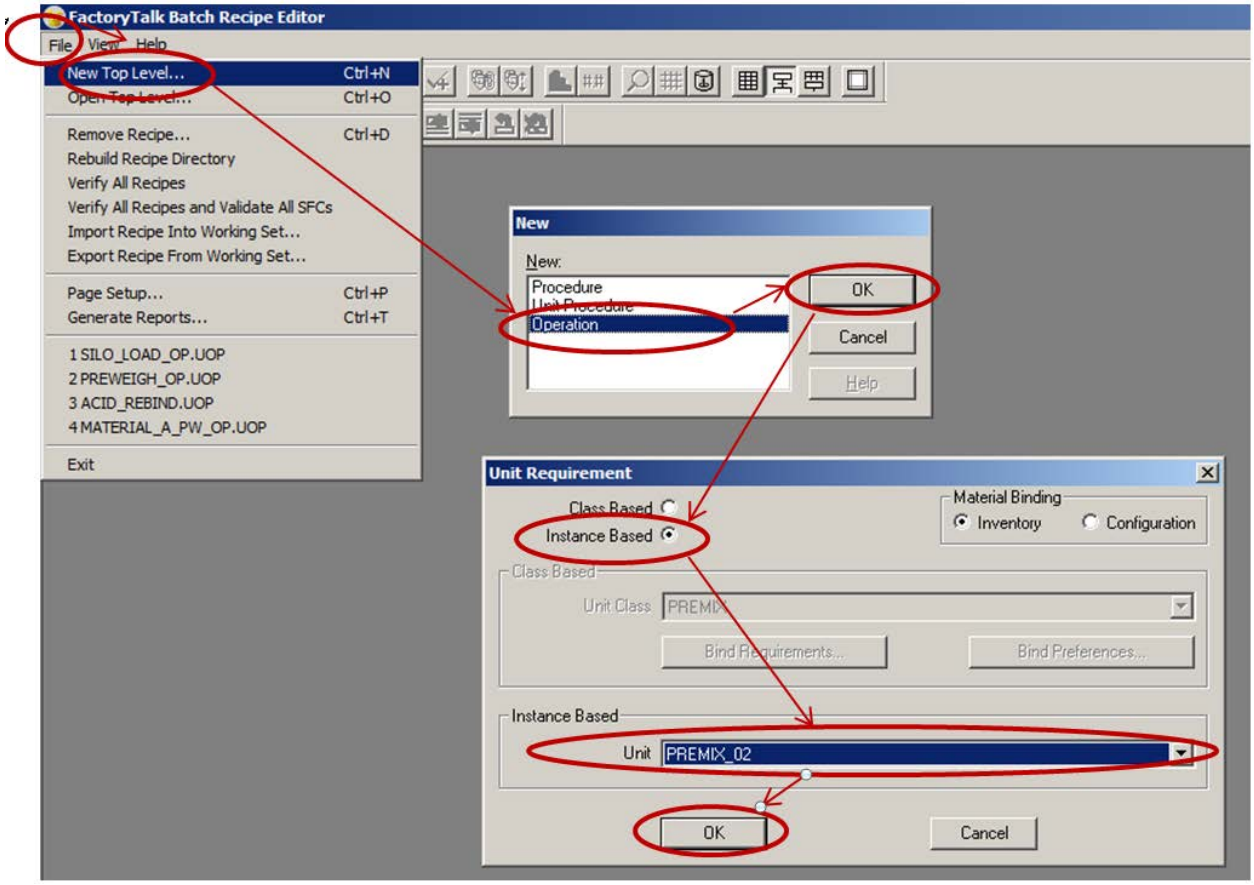
Lab 2: Factory Talk Batch "eProcedure"

Let's create a recipe that will run in the Premix 02 unit and contains the Test Prompt phase.

1. Open the Recipe Editor, make sure the Recipe Editor is closed before you open it again; this is required so it can read the new area definition that includes the new phase.
   From the Equipment Editor select the ***Recipe Editor*** button.

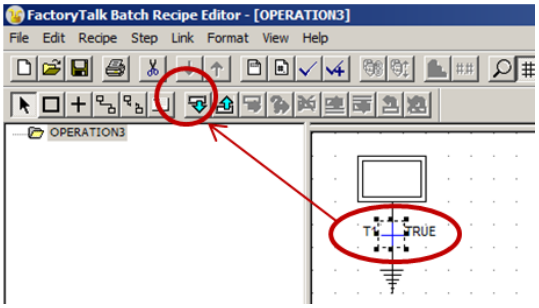


2. Once the recipe editor is open. Create a ***New Top Level*** recipe, select an ***Operation*** type recipe. Select the ***Instance Based radial button*** and pick *the* ***PREMIX_02*** unit.

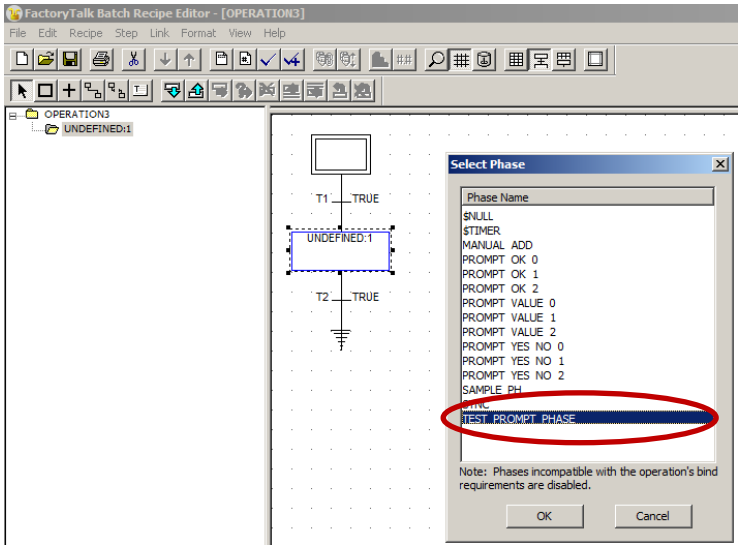


Lab 2: Factory Talk Batch "eProcedure"

3. A new Operation level recipe is created; to insert a phase select the transition labeled T1 then selects the Blue down arrow button.

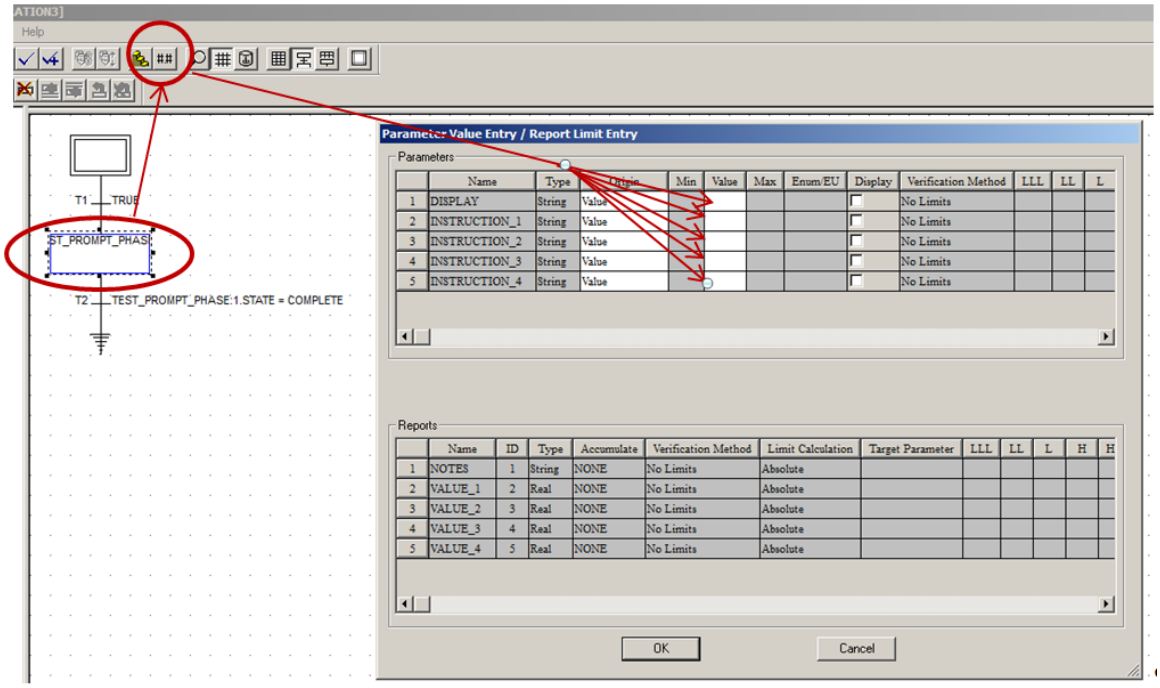


4. The available phases for that unit will be listed, select **TEST PROMPT PHASE** then the ***OK*** button.

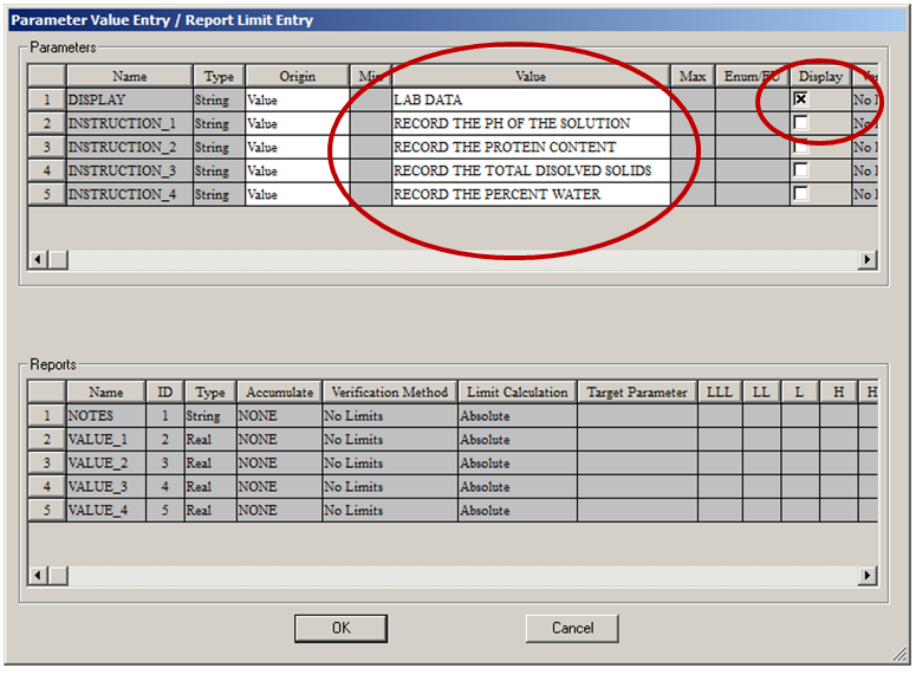


Lab 2: Factory Talk Batch
"eProcedure"

5. The new phase has been added to the operation, now it is time to configure the values we wish to display to the operator once this phase is run.

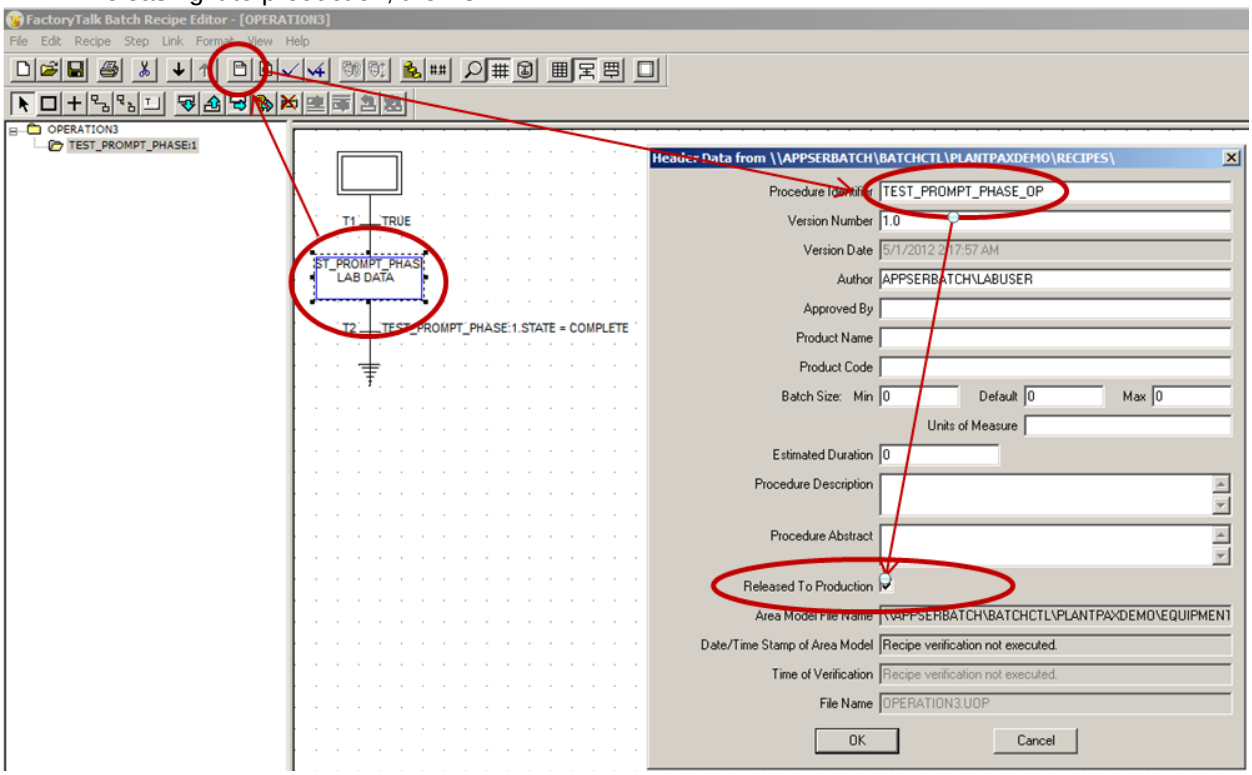


6. For this lab let's record the material properties that the Lab analysis had provided.
Type in to the value field the desired message to be displayed. Select the display button for the first parameters.

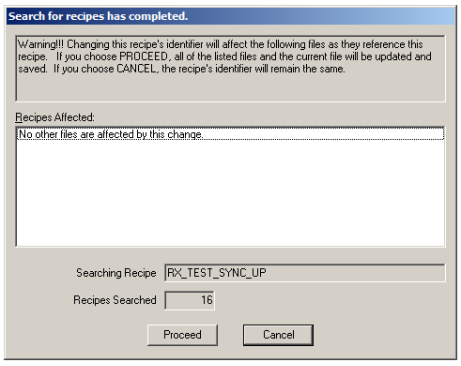


Lab 2: Factory Talk Batch "eProcedure"

7. Complete the recipe information by selecting the Recipe Header data, naming the operation and releasing it to production, then ***OK***.



The recipe editor checks if this name change will affect any other recipes.

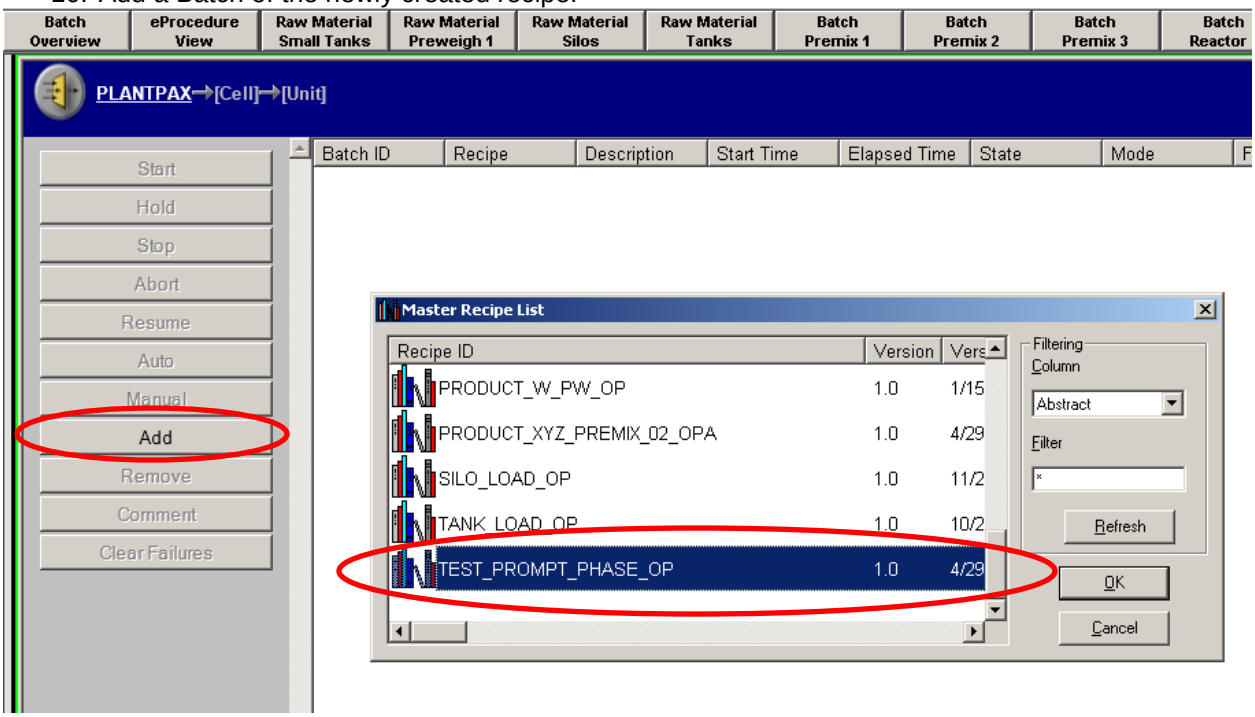


8. Select ***Proceed*** to complete the recipe setup, then select ***Save***.

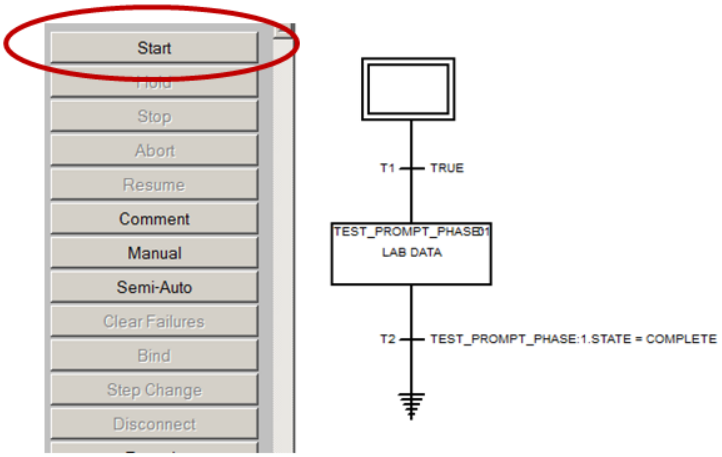
Lab 2: Factory Talk Batch "eProcedure"

9. Switch back to the PASS01 image and create a control recipe from the eProcedure Batch list available from the HMI. Select the ***eProcedure View*** button from the navigation bar

10. Add a Batch of the newly created recipe.

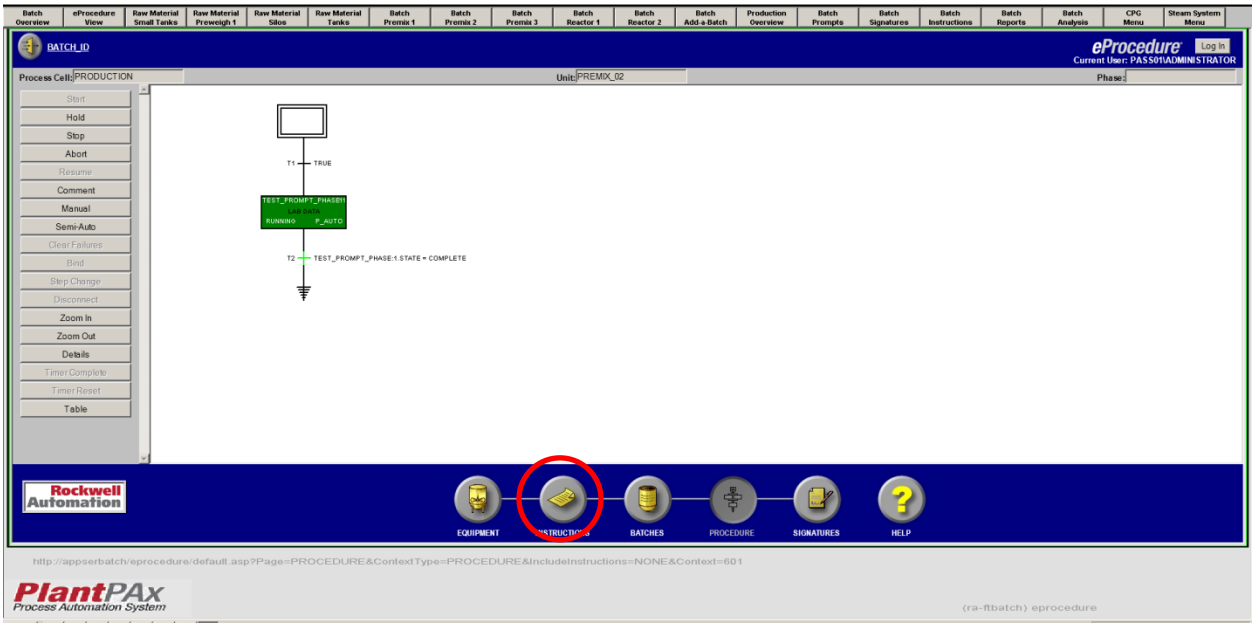


11. Select the start and wait for the prompt indicator to become active.



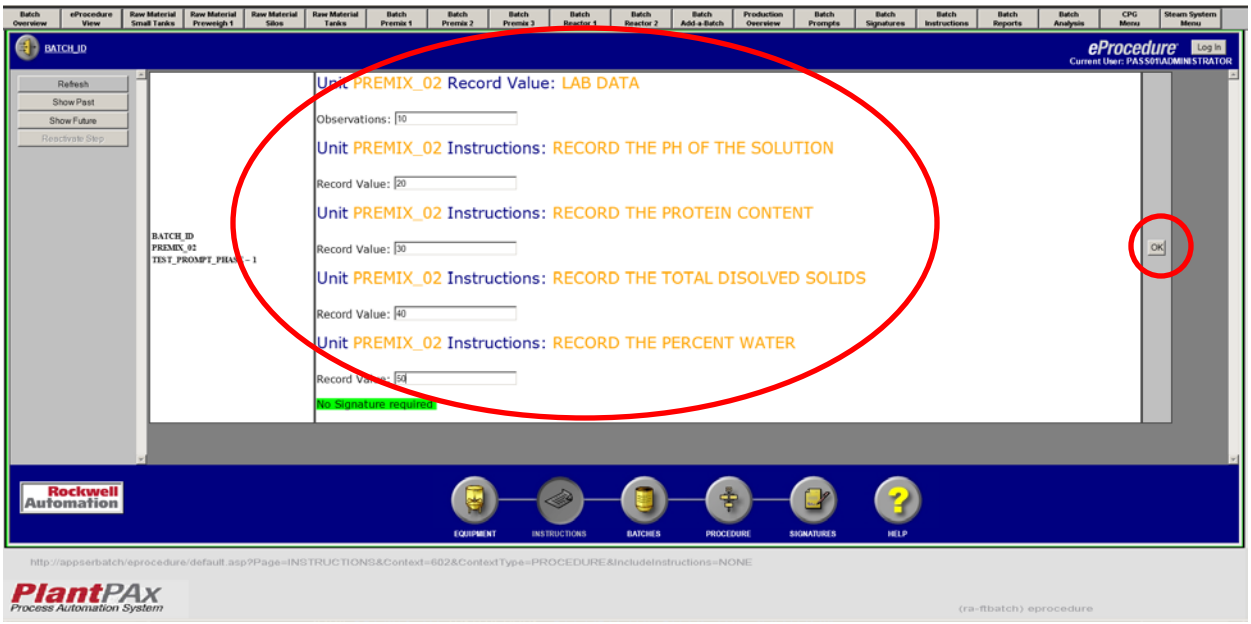
Lab 2: Factory Talk Batch "eProcedure"

12. Select the ***Instruction*** button to view the prompts coming from the recipe.



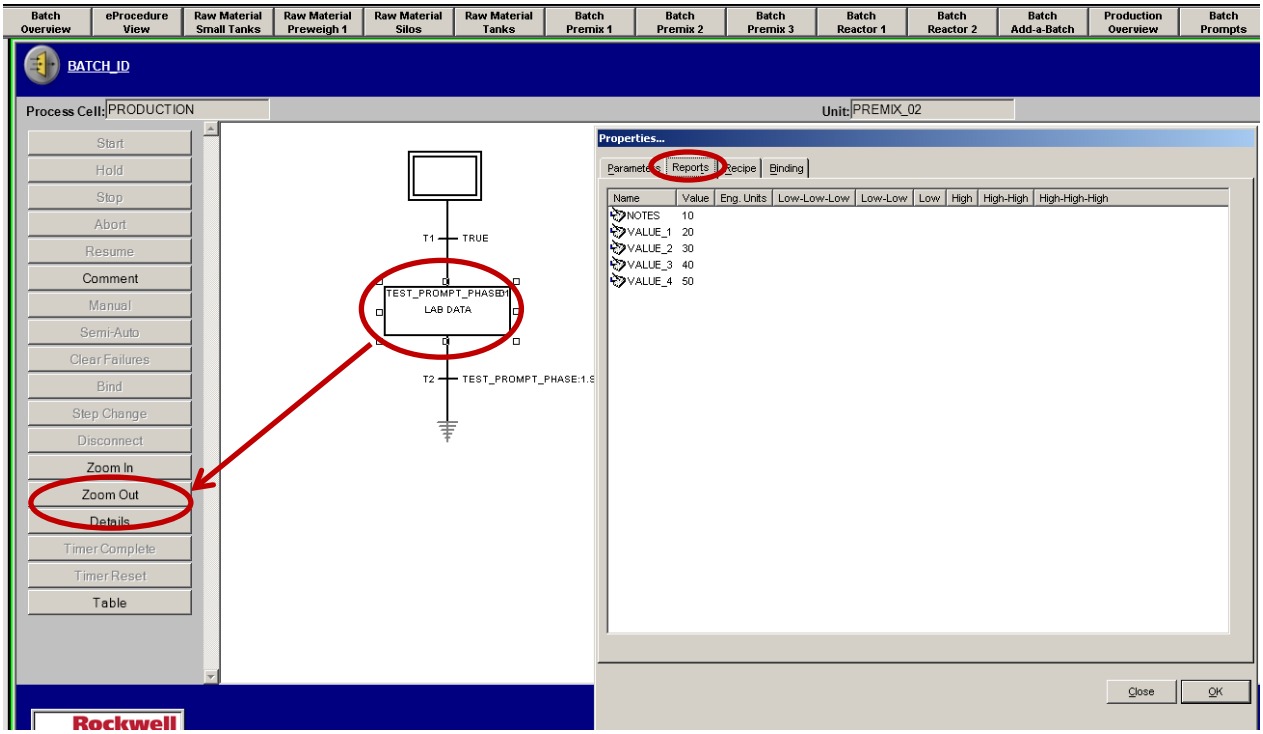
Lab 2: Factory Talk Batch "eProcedure"

13. The following will be displayed. Enter values for the required field and then select the ***OK*** button.



Lab 2: Factory Talk Batch "eProcedure"

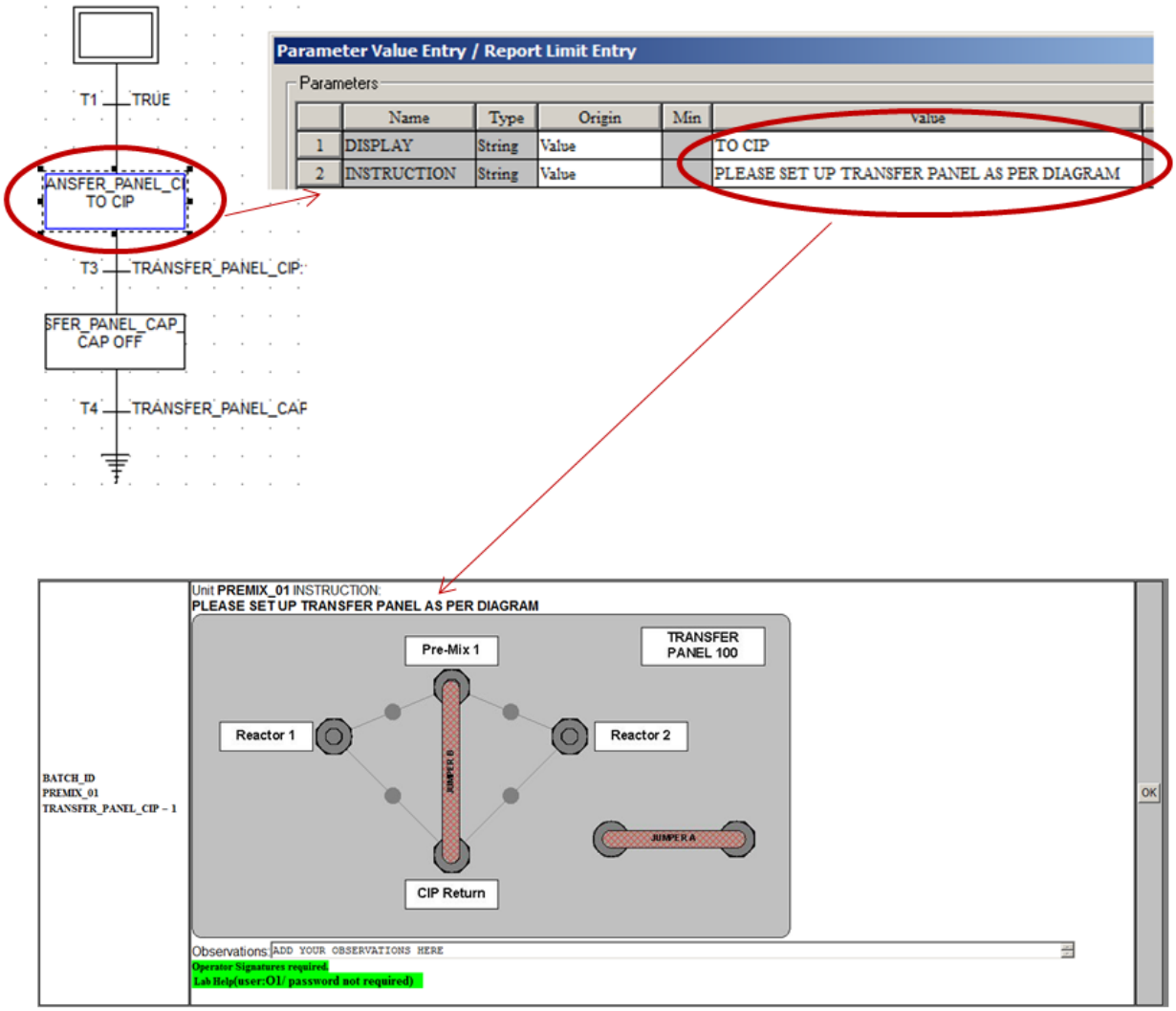
14. Go back to ***Procedure View*** confirm that the batch has completed and the values had been captured. Select the phase then select the ***DETAILS*** button and the ***Report*** tab.



Lab 2: Factory Talk Batch "eProcedure"

Displaying images on the operator instructions

The following is an example of a phase using Photo or bitmap to aid operators with equipment setup. Videos, Word documents and pdf files, also can be displayed in an eProcedure instruction.



End of lab.

Lab 2: Factory Talk Batch
“eProcedure”

Lab 3: Factory Talk Batch
"Material Manager"

Lab3: Factory Talk Batch " Material Manager"

Lab3: Factory Talk Batch " Material Manager"

Introduction

Material Management with FactoryTalk Batch "Material Manager"
Material Manager catalogs inventory of raw, intermediate, and finished materials in a format commonly found in batch processing. For each received or produced material, inventory includes:

- Material type,
- On-hand quantity,
- Received lot id,
- Distribution sub lot id,
- Received date,
- Status (such as "QA Hold" or "Released),
- Attributes (such as lab assay results),
- Consumption priority, and
- Storage locations.

Storage locations are defined as containers, again, a format that readily supports batch processing. The three container types are:

• Composite	(one material & lot / container)	for example	a liquid storage tank
• Plug Flow	(one material & many lots / container)		solids in a silo
• Pallet	(many materials / container)		a "kitted" delivery

Containers can be assigned attributes including:

- Capacity
- Allowable materials
- Status (such as "Available" or "Out-of-Service")
- Current material and quantity

As one of the FactoryTalk Batch components, Material Manager embeds Material Management features into Batch Process Management. When Material Manager is incorporated into a FactoryTalk Batch solution, the following occurs seamlessly and automatically:

- Containers, needed to support materials defined in the recipe, are selected
- Theoretical inventory is maintained, updated from batch phase execution
- Lot and Sub Lot ID's are recorded in the batch journal
- Container(s) are recorded in the batch journal

Material Manager Features and this Lab

This lab explores Material Manager benefits when incorporated in a FactoryTalk Batch solution and

Lab 3: Factory Talk Batch
"Material Manager"

consists of two parts. The first part of the lab uses four common process scenarios to demonstrate the features of a Material Manger based solution. The four scenarios are:

- Split Feeds more than one container is needed to satisfy a recipe's quantity
- Plug Flow more than one lot, in single container, is needed to satisfy a recipe's quantity
- Container proper container selection when the same material exists in multiple locations
- Inventory a phase is held until needed inventory is received and distributed

The material database is initially configured for each scenario, however full instructions are provided for receiving and distributing materials needed to support the scenarios. This provides participants the ability to understand and explore the Material Manager database as well as repeat a scenario if desired.

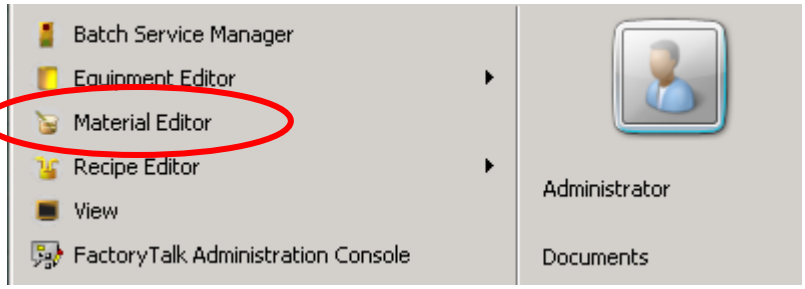
The second part of the lab demonstrates how Material Manager can be extended into the plant, in this case the receiving dock. The solution demonstrates how the open materials database (MicroSoft SQL based) can be accessed from a HMI using product supported ActiveX components, FactoryTalk Batch API's (Application Programming Interfaces) , and VBA (Visual Basic for Applications). Finally, the example shows Material and Batch Management functions in a weighing scenario.

Split Feeds (Tank Depletion) and Rebinding

Split feeds occur when a material phase step does not add or distribute all of the material configured by the step. By default, the batch is HELD and the Material Server calculates and sends new AMOUNT parameters to the FactoryTalk Batch Server. To resume processing, the operator must perform an active step change away from the unfinished step, manually rebind the unfinished step, perform an active step change back, and then restart the batch. Optionally, the recipe can be configured to automatically process a split feed. The following example illustrates the automatic rebinding to a new container after the contents of the initial container are depleted.

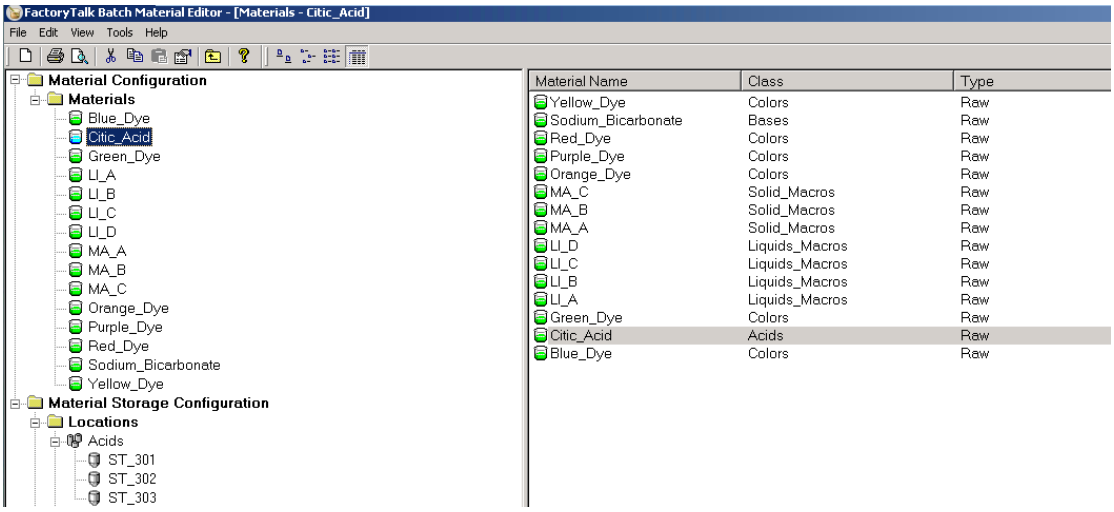
Setup

1. On the **AppSerBatch** image, open the Material Editor. (**Start**> **Material Editor**.)



2. Expand **Material Configuration -> Materials.**

Lab 3: Factory Talk Batch
"Material Manager"

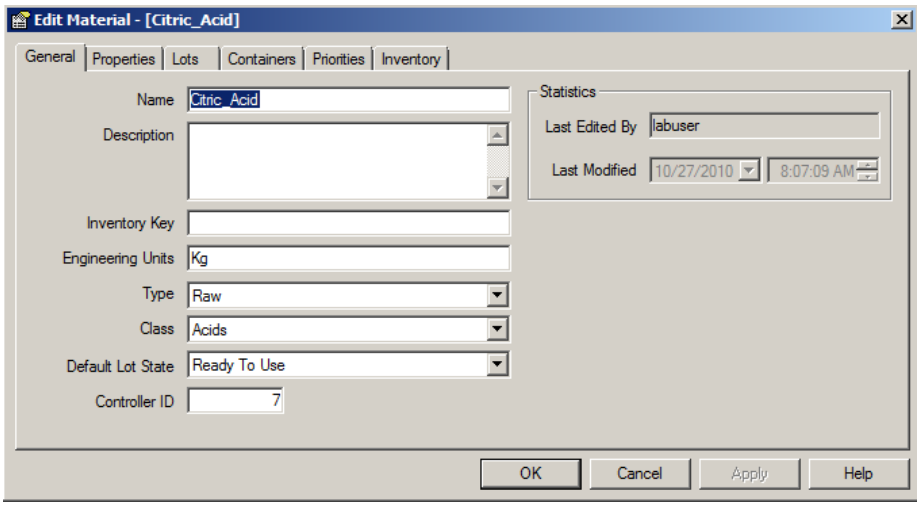


For this example, the citric acid material will be configured per the table below:

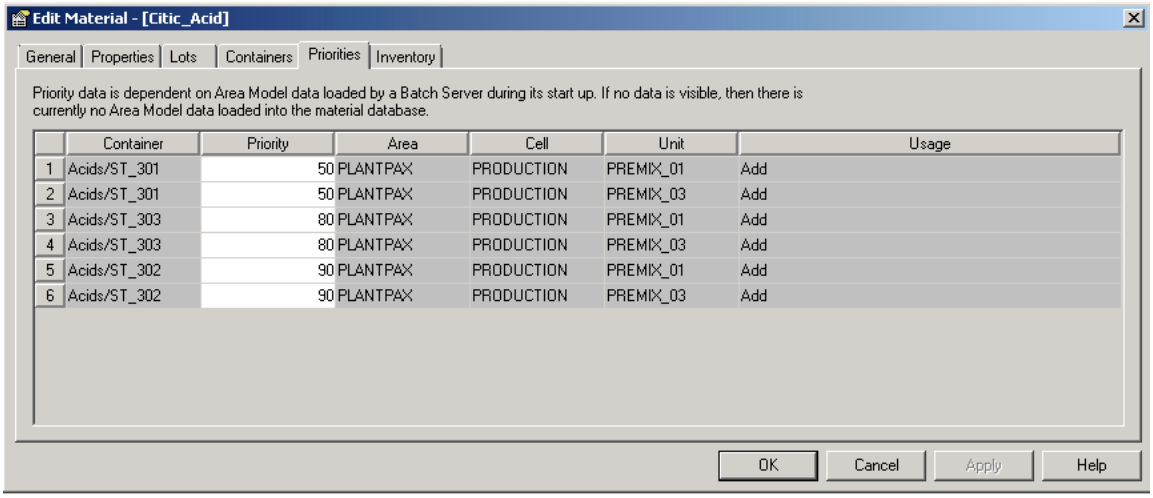
Container	Material	Quantity	Priority	Lot ID	Label
ST301	Citric Acid	75kg	50	AA	XI
ST302	Citric Acid	500kg	90	AB	XII
ST303	Citric Acid	500kg	80	AC	XIII

Note: The container priorities define the order in which containers are considered as candidates for binding the material.

3. Double-click **Citric_Acid** to launch the **Edit Material** dialog box.



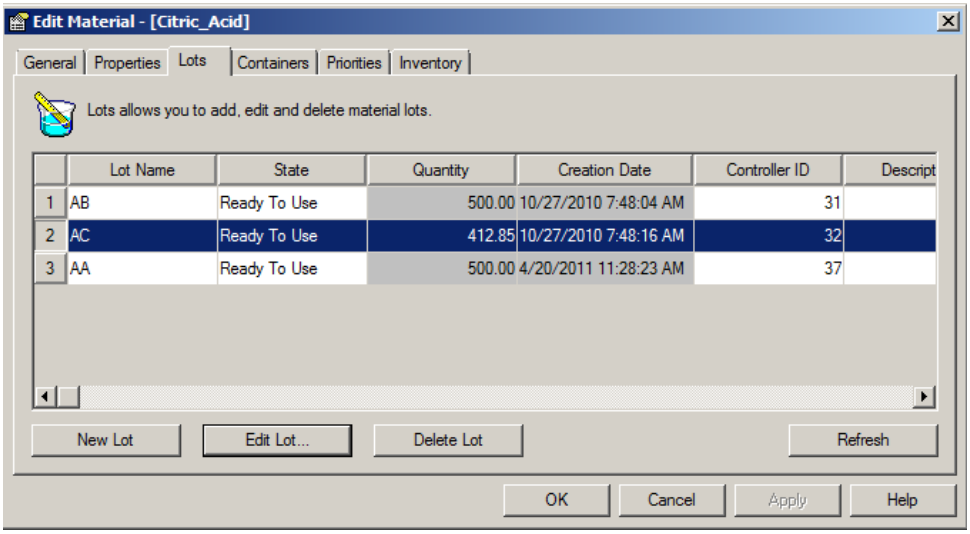
4. Click on the **Priorities** tab. Confirm the priorities are configured per the table above. If not, update the priority value, and then click **Apply**. Each container is listed twice because they are bound to both units Premix_01 and Premix_03.



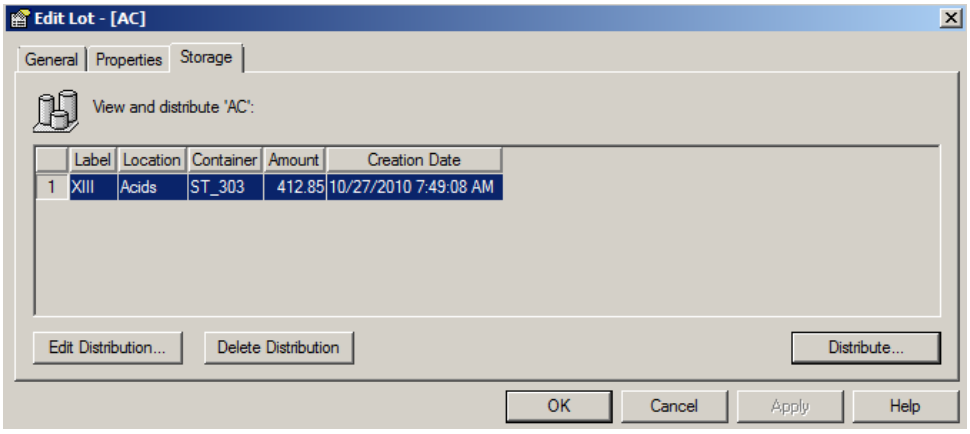
	Container	Priority	Area	Cell	Unit	Usage
1	Acids/ST_301	50	PLANTPAX	PRODUCTION	PREMIX_01	Add
2	Acids/ST_301	50	PLANTPAX	PRODUCTION	PREMIX_03	Add
3	Acids/ST_303	80	PLANTPAX	PRODUCTION	PREMIX_01	Add
4	Acids/ST_303	80	PLANTPAX	PRODUCTION	PREMIX_03	Add
5	Acids/ST_302	90	PLANTPAX	PRODUCTION	PREMIX_01	Add
6	Acids/ST_302	90	PLANTPAX	PRODUCTION	PREMIX_03	Add

Lab 3: Factory Talk Batch
"Material Manager"

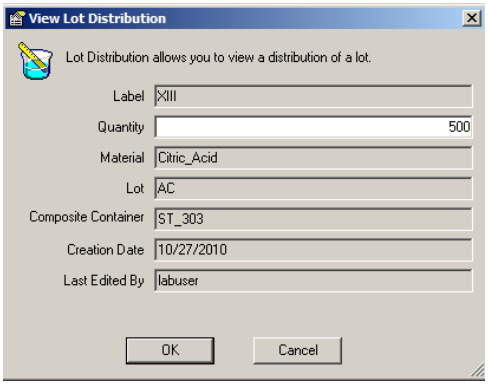
5. Select the **Lots** tab. Update the quantity for each of the lots per the table above. Highlight the row for the Lot, and then click **Edit Lot**. If no lots are present skip to step 9.



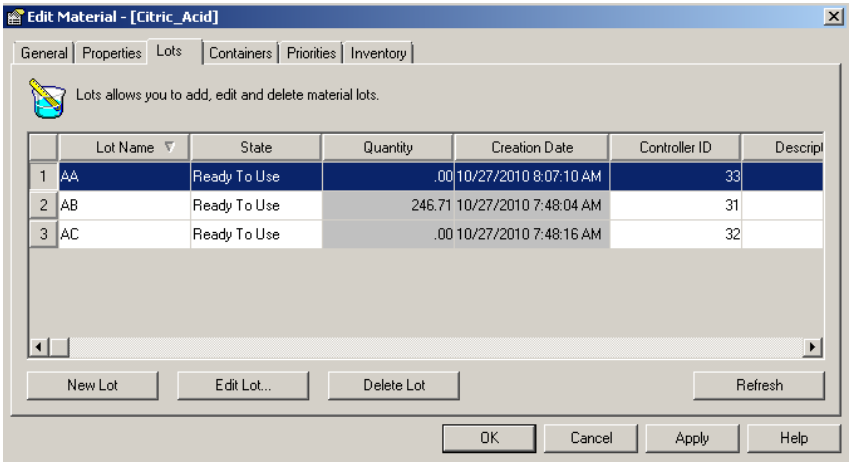
6. Select the **Storage** tab, highlight the distribution, and then click **Edit Distribution**



7. Enter the desired quantity, and then click **OK**. Click **OK** again to close the Edit Lot dialog box.

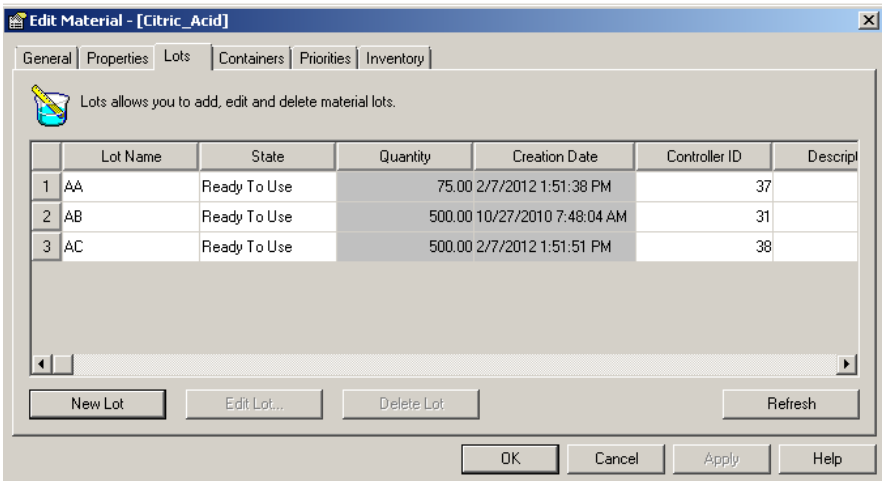


8. If a lot has been depleted, you will need to delete the Lot and add a new Lot. Delete Lots by highlighting the lot and clicking **Delete Lot**.

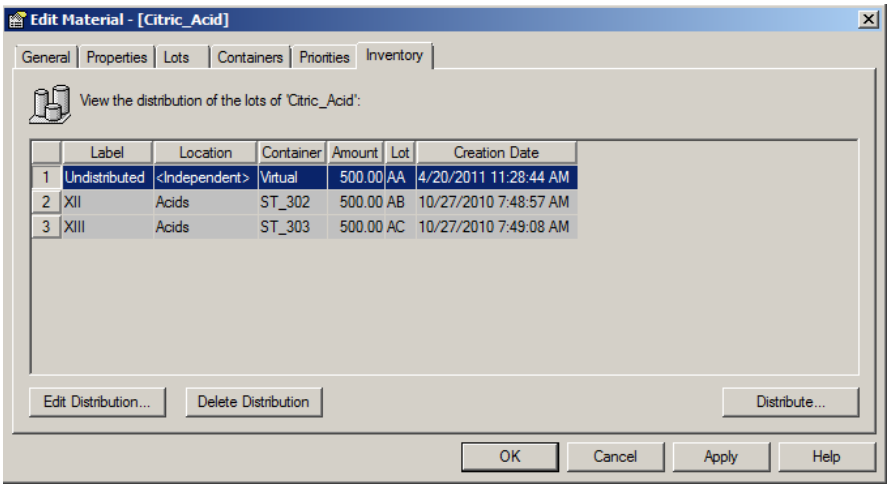


Lab 3: Factory Talk Batch
"Material Manager"

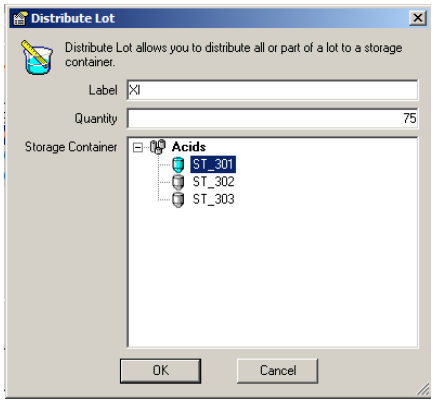
9. Add Lots by selecting **New Lot**, enter the Lot name and quantity, and then click **Apply**.



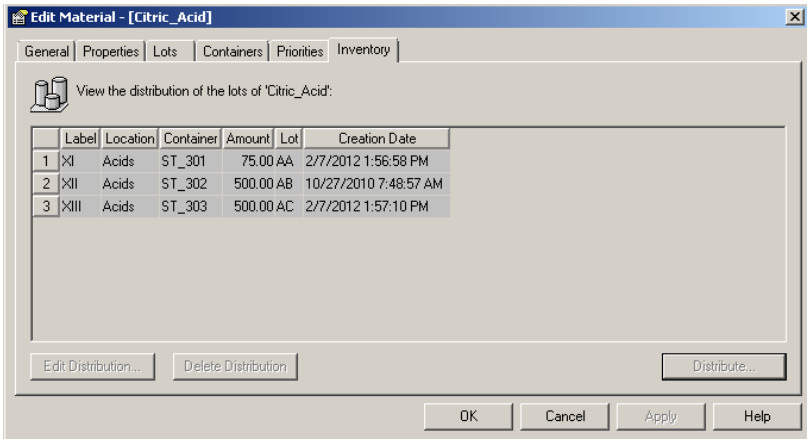
10. Select the **Inventory** Tab. For each newly added lot, distribute the lot by clicking **Distribute**.



11. Enter the desired label and quantity, select the appropriate storage container and then click **OK**.



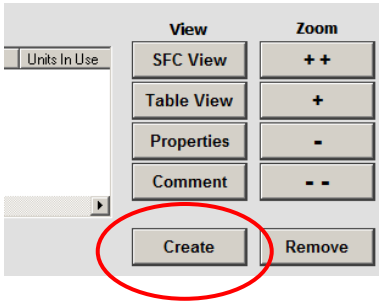
12. The Citric Acid Inventory should be setup as shown below.



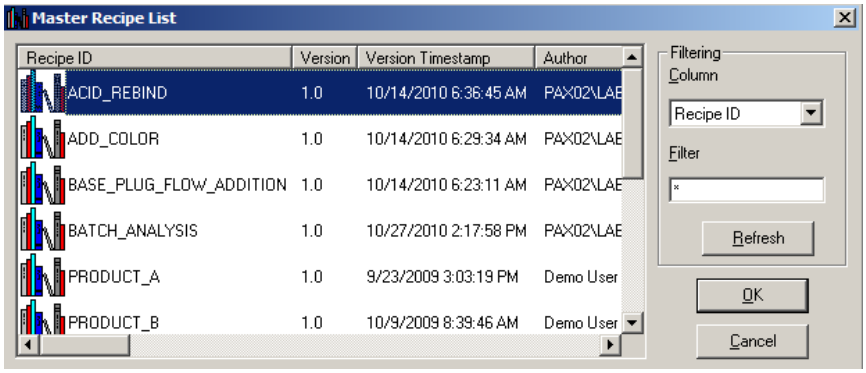
Lab 3: Factory Talk Batch
"Material Manager"

Run the Batch

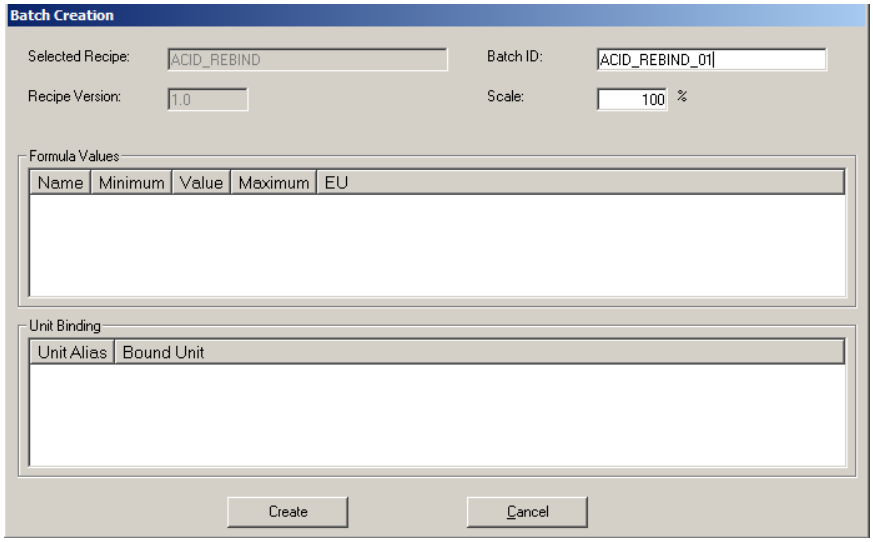
1. From the HMI on the PASS01 image, select **Batch Premix 1** from the menu bar. Select **Batch System Menu** if the Batch menu bar is not displayed and then **Batch Premix 1**.
2. Click Create



3. Select the **Acid_Rebind** recipe. Click **OK**.

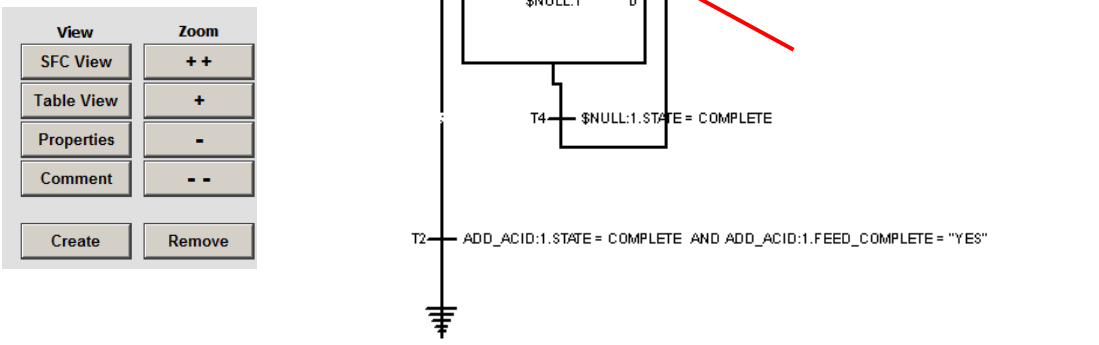


4. Enter a Batch ID and click **Create**.



Lab 3: Factory Talk Batch
"Material Manager"

5. Click on the batch then on **SFC View** and note the procedure, with loop-back if Feed_Complete = No.

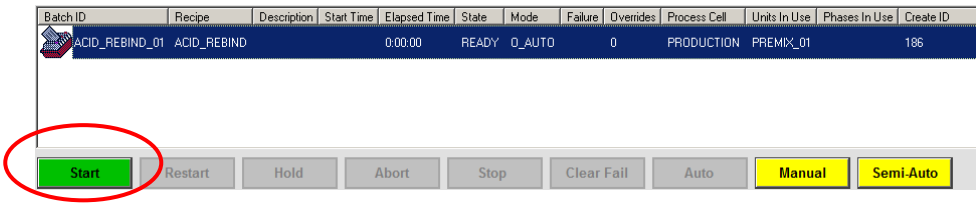


Note: The **FEED_COMPLETE** report parameter is a signal to the FactoryTalk Batch Server that the addition or distribution completed successfully. A lack of material, lack of storage capacity, phase failure, or stopping a phase could all result in the interruption of a material addition or distribution. When this occurs, the phase logic sets FEED_COMPLETE to false, so that batch execution is held until the phase can rebind to another container.

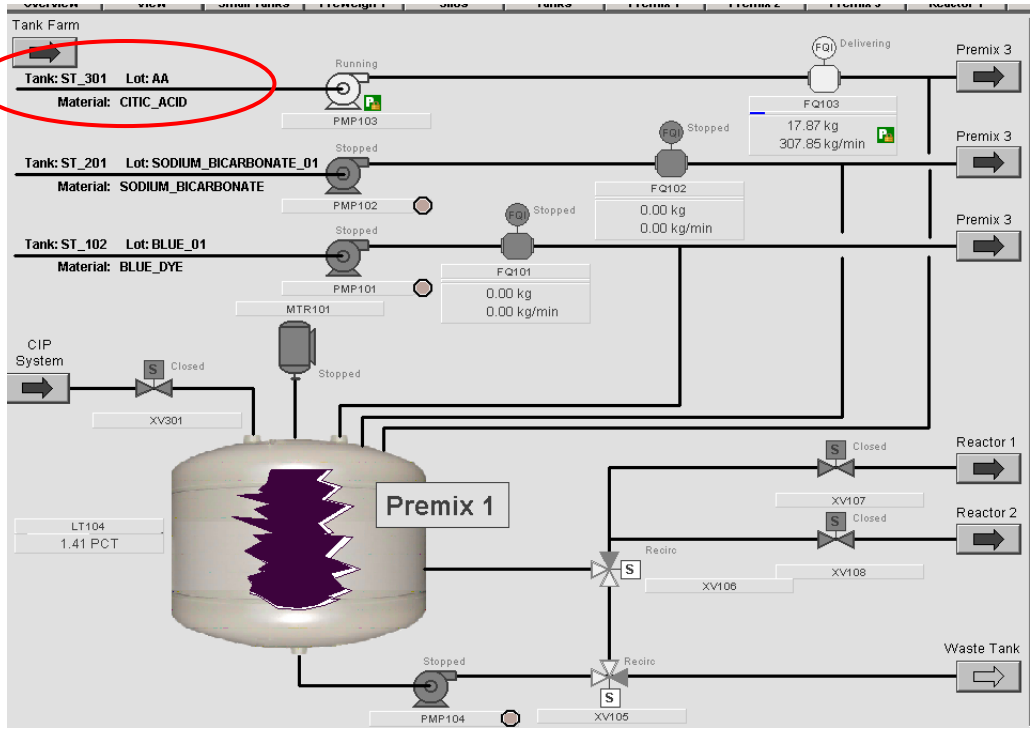
The Material Server updates the material database with actual amounts consumed or distributed during a batch run. During an addition or distribution, when the Feed Complete is true, the FactoryTalk Batch Server communicates the actual amount to the Material Server. When the Feed Complete is not true, the FactoryTalk Batch Server communicates the actual amount to the Material Server, which in turn calculates the difference between the promised amount and the actual amount and sends this back to the FactoryTalk Batch Server. The FactoryTalk Batch Server uses this difference to update the setpoint for the split feed.

6. Start the Batch.

Lab 3: Factory Talk Batch
"Material Manager"

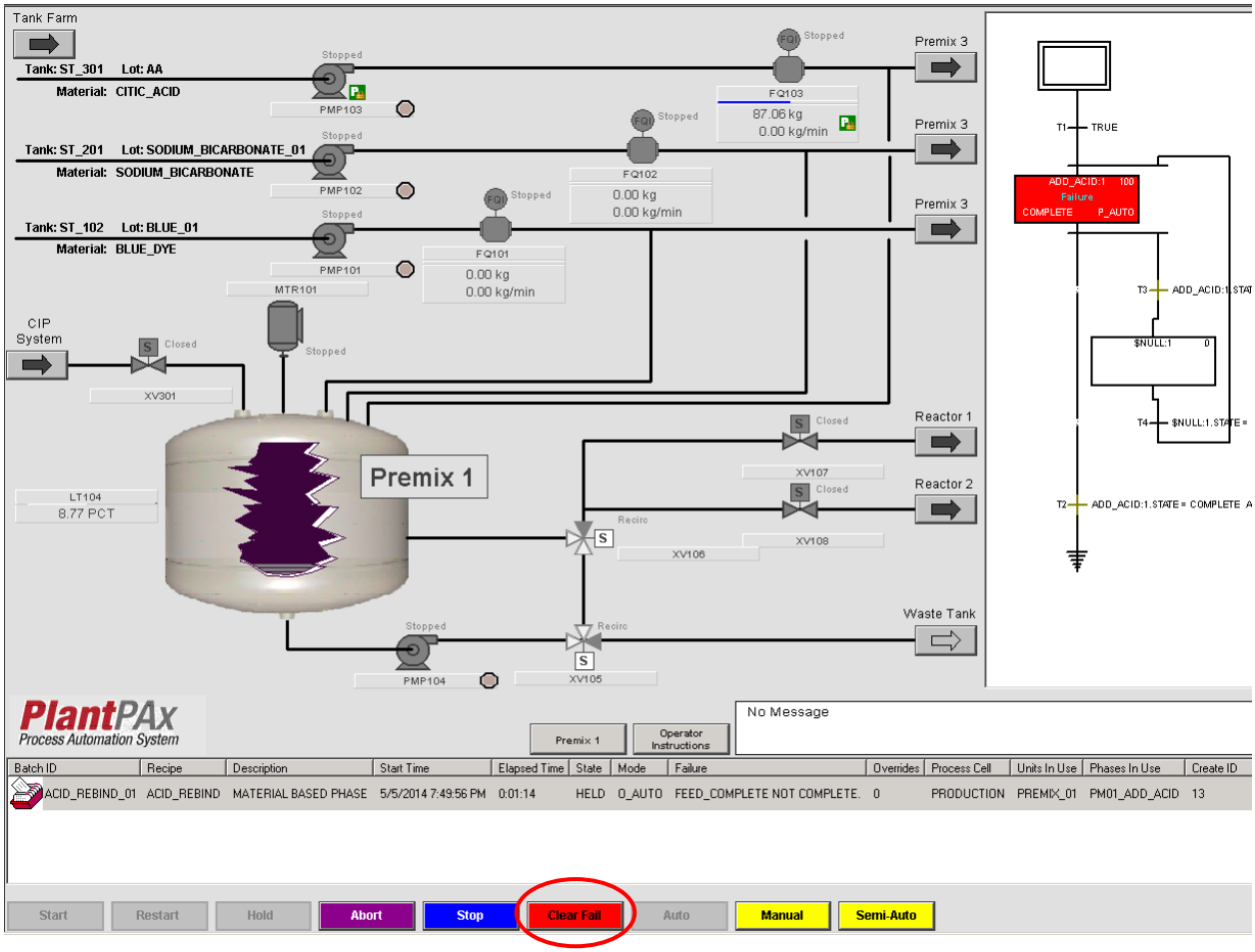


7. Note the Tank and Lot Number being used as the acid source.

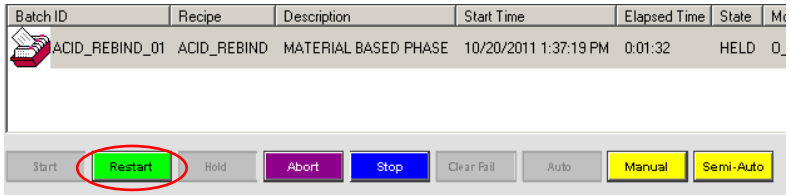


Lab 3: Factory Talk Batch
"Material Manager"

8. When the delivered amount exceeds 75kg, the simulation indicates the tank is empty. Click **Clear Fail**.

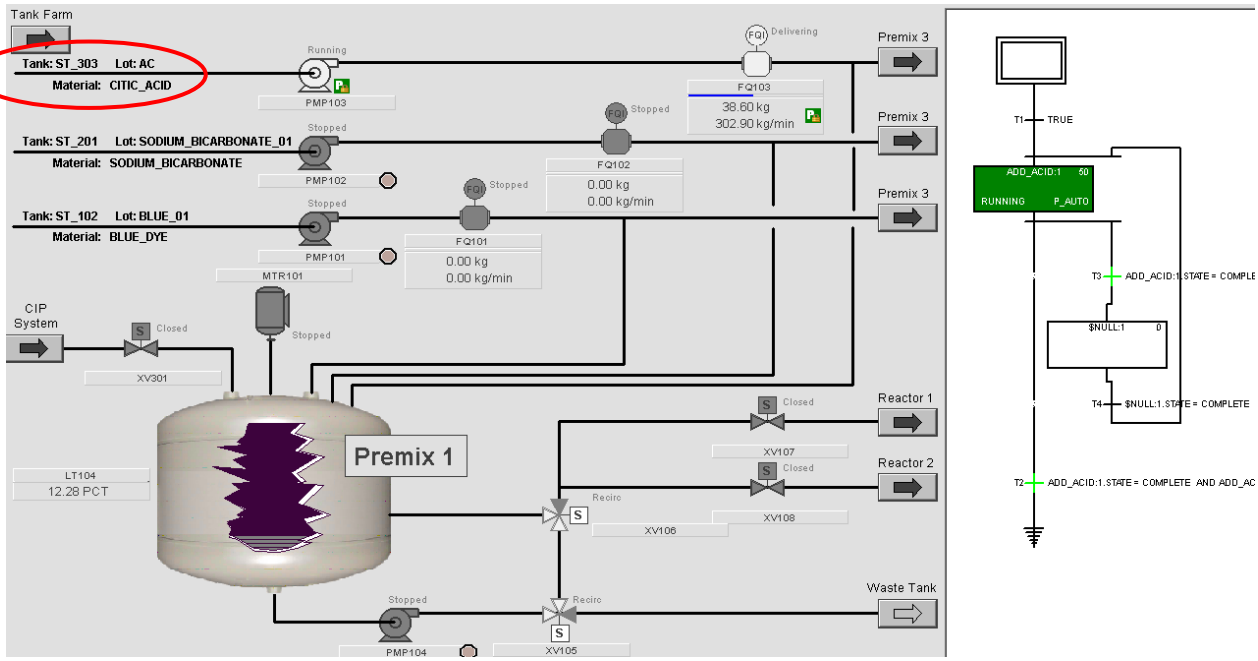


9. Click **Restart.**



Lab 3: Factory Talk Batch
"Material Manager"

10. When the feed begins a second time, note the new Tank and Lot Numbers.

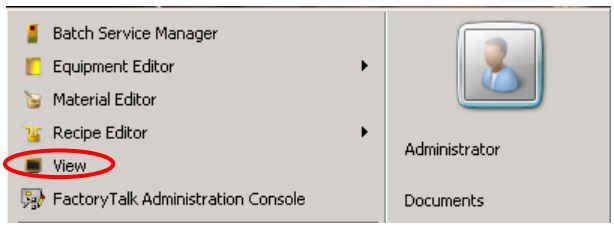


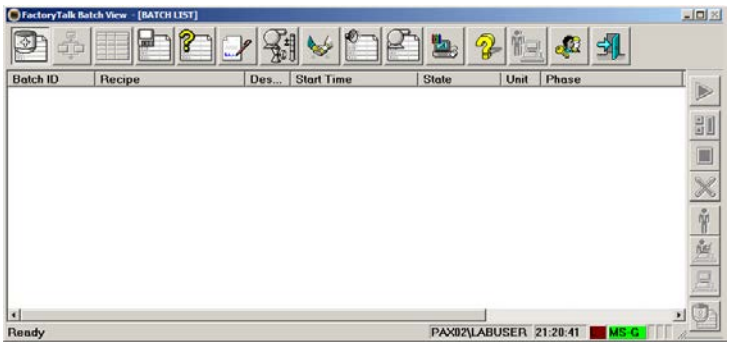
The batch has rebound to a new container, and picked the highest priority container. The system has also calculated a new setpoint (Parameter 2), which is the remaining amount needed to add.

11. Let the batch complete, when completed select the batch and remove it from the Batch List by selecting the **Remove** button

.

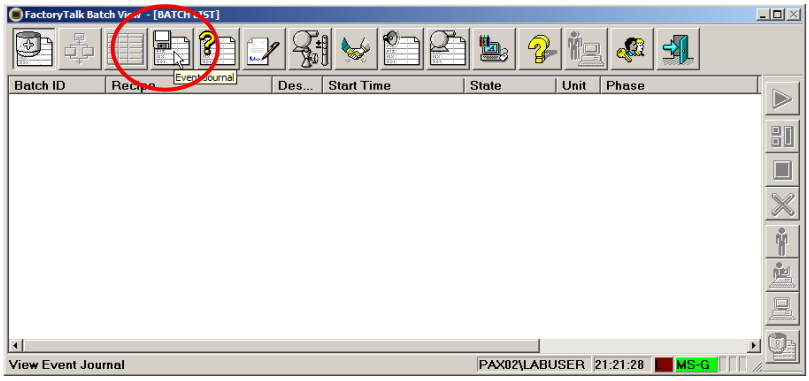
12. Start Batch View from the **AppSerBatch** image.



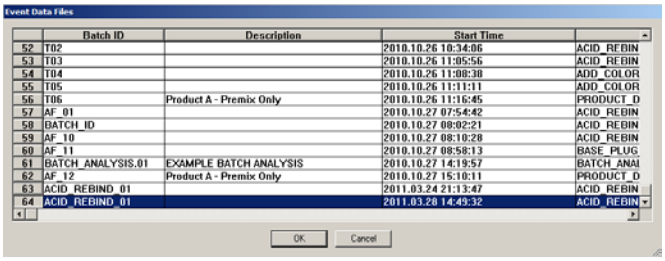


Lab 3: Factory Talk Batch
"Material Manager"

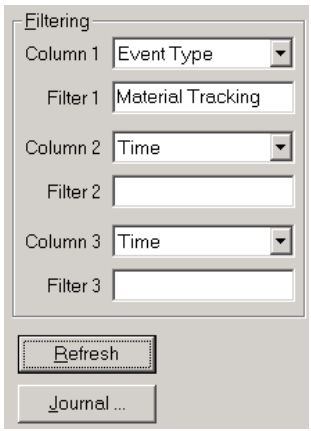
13. Click Event Journal.



14. Click the Journal button.
15. Select your batch from the list. Click **OK.**

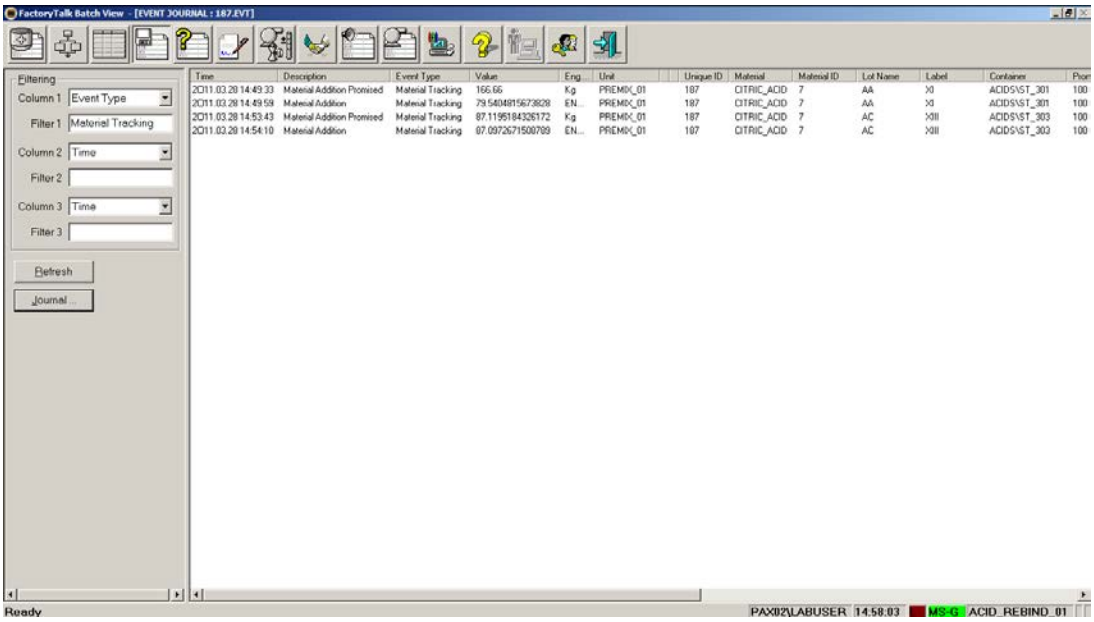


16. Set Filters (click Refresh once set)
    a. Column 1: Event Type
    b. Filter 1: Material Tracking (type this in)
    c. Click the **Refresh** button.



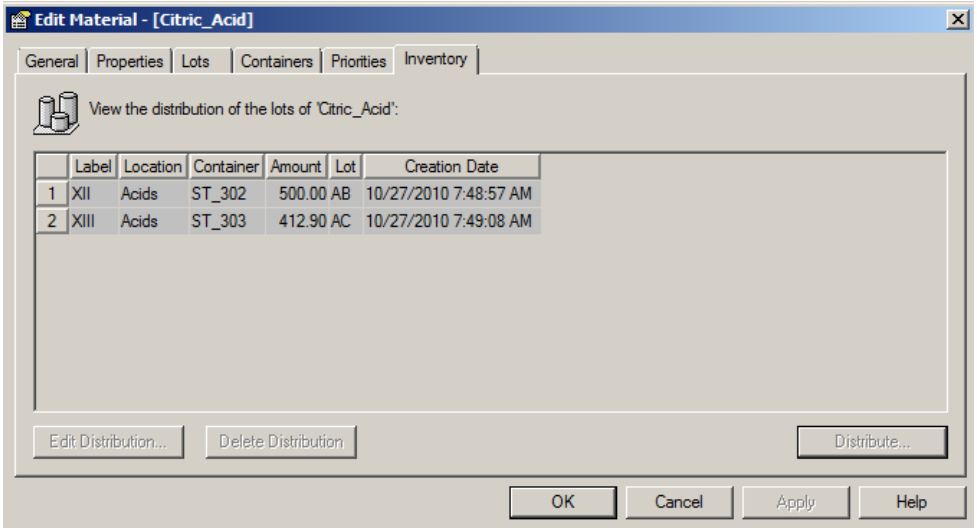
Note that additions from both tanks are recorded, along with their quantities and lot ID's.

Lab 3: Factory Talk Batch
"Material Manager"



17. Observe inventory for Citric Acid in Material Manager. (Select **Start -> Material Editor**, expand Materials, double-click Citric Acid and select **Inventory** tab)

    a. Lot AA is depleted and no longer in inventory in Tank ST_301
    b. Lot AC has been decremented accordingly.



Lab 3: Factory Talk Batch
"Material Manager"

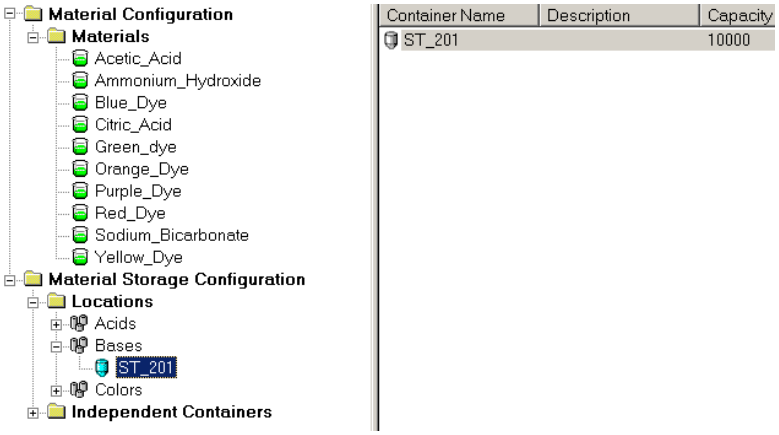
Plug Flow Transition

A plug flow container holds one type of material, but is comprised of two or more different lots. The first lot that went in is the first to come out. The following example illustrates the transition between lots when a lot is depleted.

Note: Admittedly, it is unrealistic to have a liquid tank configured as plug-flow. Imagine this material is a powder and the delivery system to the Premix Tank is a powder delivery system.

Setup

1. On the **AppSerBatch** image, open the Material Editor. (**Start ->** **Material Editor**.)
2. Expand **Material Storage Configuration -> Locations -> Bases**.



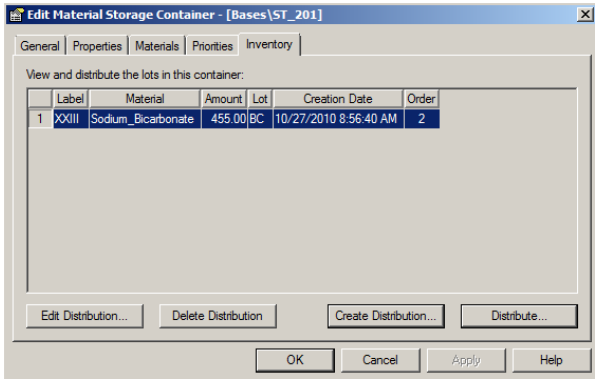
For this example, the Sodium Bicarbonate material will be configured per the table below:

Container	Material	Quantity	Priority	Lot ID	Label
ST201	Sodium Bicarbonate	75kg	n/a	BA	XXI
ST201	Sodium Bicarbonate	25kg	n/a	BB	XXII
ST201	Sodium Bicarbonate	500kg	n/a	BC	XXIII

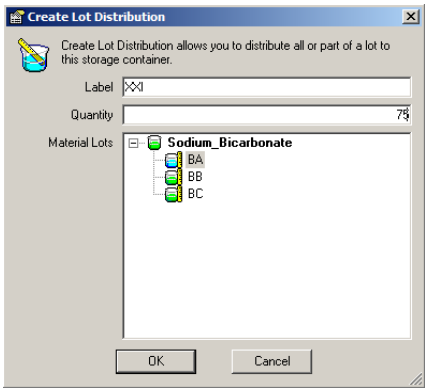
Note: Container priority is not applicable since all additions are from the same container. Be sure to add the distributions listed in the order above.

Lab 3: Factory Talk Batch
"Material Manager"

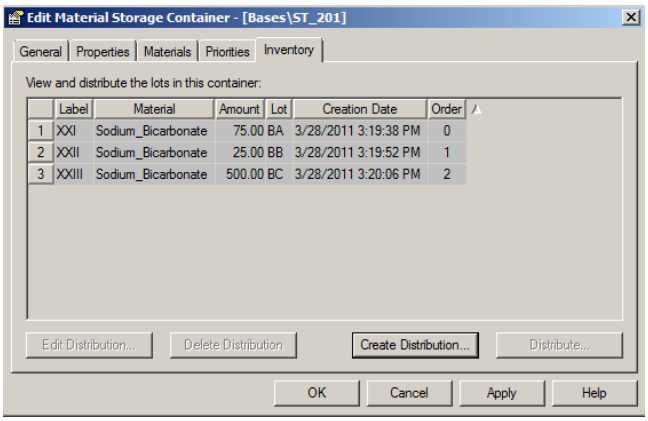
3. Double click **ST_201** to launch the **Edit Material Storage Container** dialog box. Select the **Inventory** tab.



4. Delete any existing distributions (this does not need to be done if inventory is already properly configured, skip to running a batch).
5. Click **Create Distribution**.
6. Select Material Lot **BA**, enter '**XXI'** for the label and '**75'** for the quantity (per the table above).



7. Create two more distributions per the table above. Your inventory should look like the following:

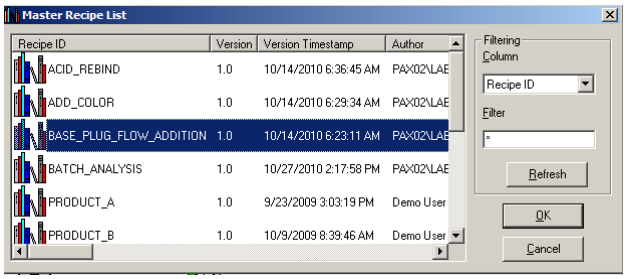


Lab 3: Factory Talk Batch
"Material Manager"

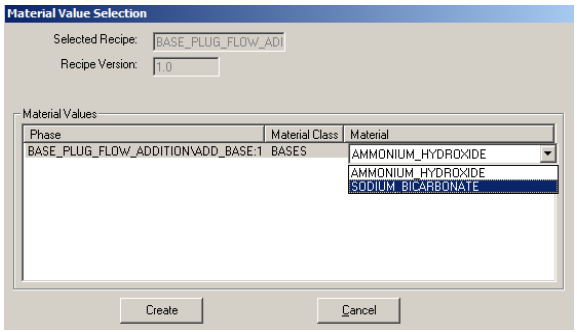
Run the Batch

1. From the HMI client on the PASS01 image, select **Batch Premix 1** from menu bar
2. Click Create

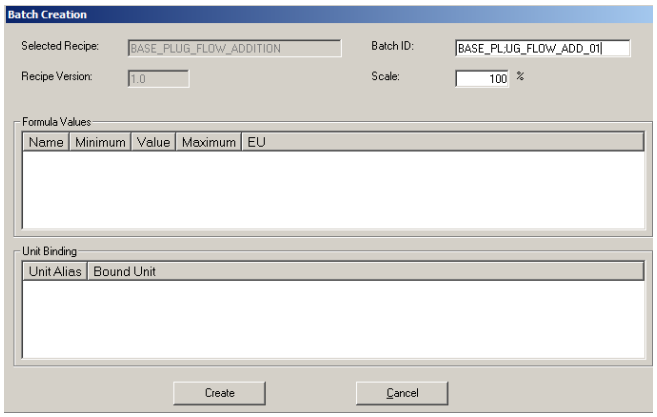
3. Select the **Base_Plug_Flow_Addition** recipe. Click **OK**.



4. Select **SODIUM_BICARBONATE** from the material drop-down list. Click **Create**.

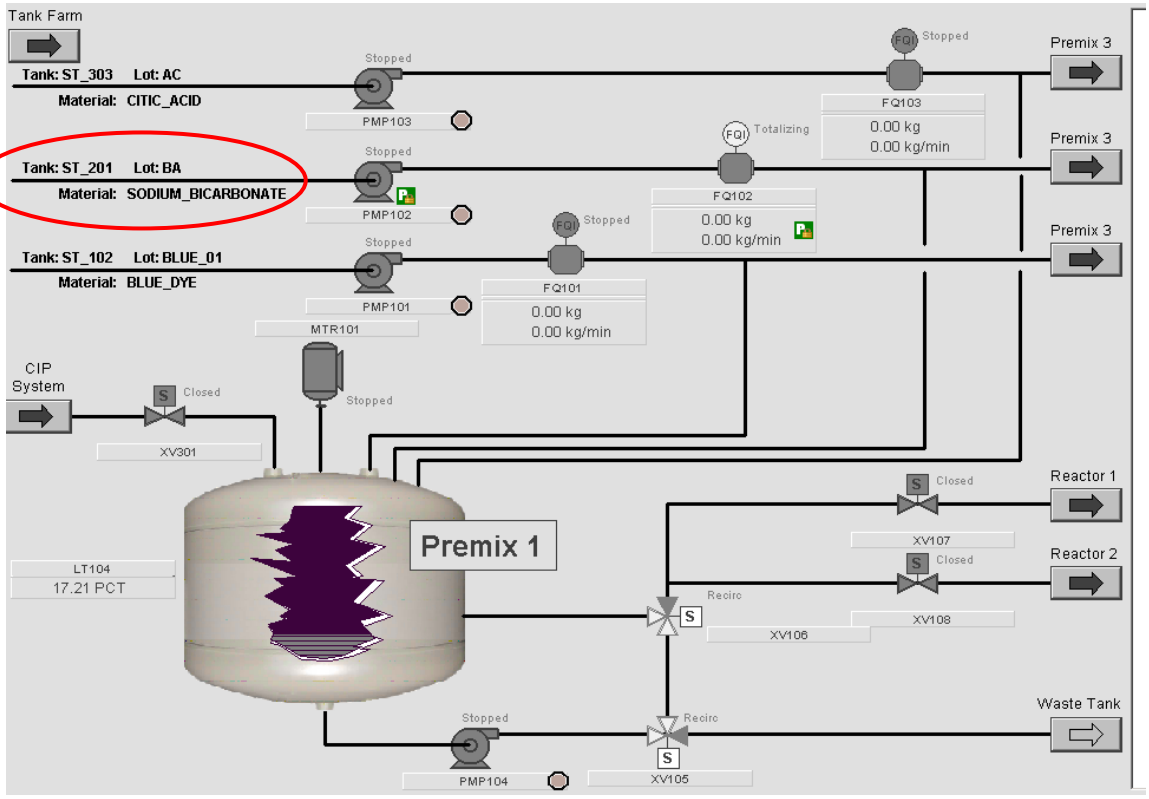


5. Type in a Batch ID

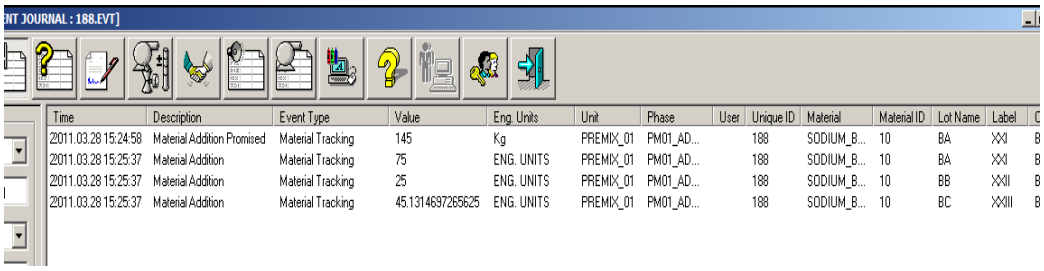


Lab 3: Factory Talk Batch
"Material Manager"

6. Start the batch.



7. Wait for the batch to complete and remove the batch from the Batch List.
8. On the **AppSerBatch** image, open the journal file for this batch (**Batch View -> Event Journal**). Note that all three lot numbers and their associated quantities are documented in the batch log.

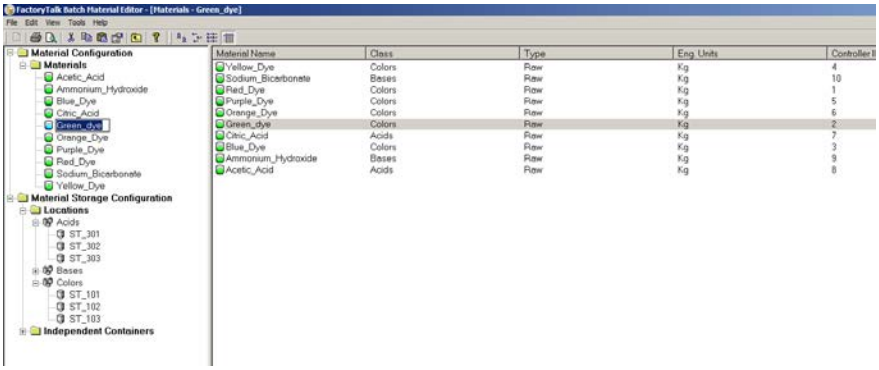


Lab 3: Factory Talk Batch
"Material Manager"

Container Selection

Setup

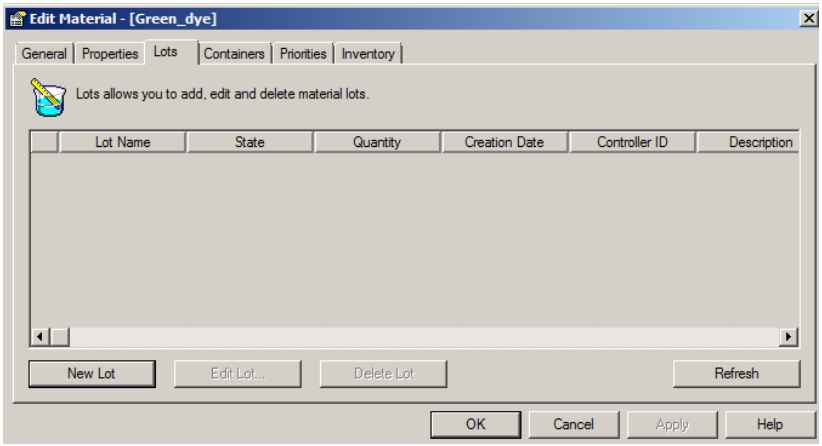
1. On the **AppSerBatch** image, open the Material Editor. (**Start ->** **Material Editor**.)
2. Expand **Material Configuration>Materials**



For this example, the color containers will be configured per the table below:

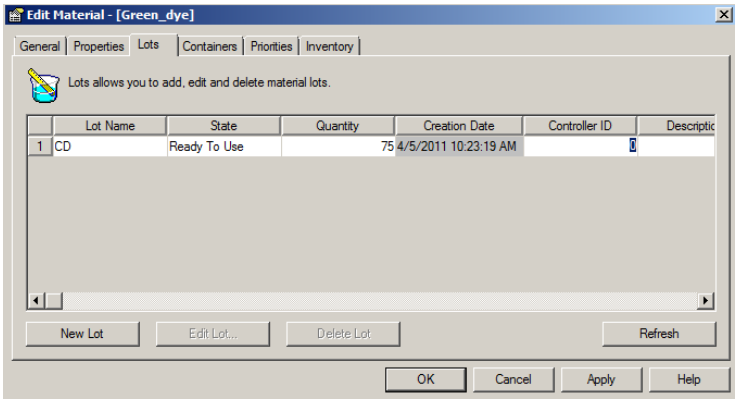
Container	Material	Quantity	Priority	Lot ID	Label
ST101	Red_Dye	75kg	50	CA	XXXI
ST102	Green_Dye	75kg	50	CD	XXXII
ST103	- none -	- -	- -	- -	- -

3. Lot CA has already been created for the red dye. A new lot, CD, will need to be created for the green dye. Double click on **Green_Dye** and select the **Lots** tab in the Edit Material dialog.

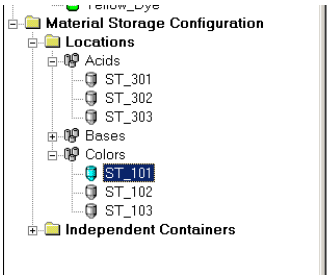


Lab 3: Factory Talk Batch
"Material Manager"

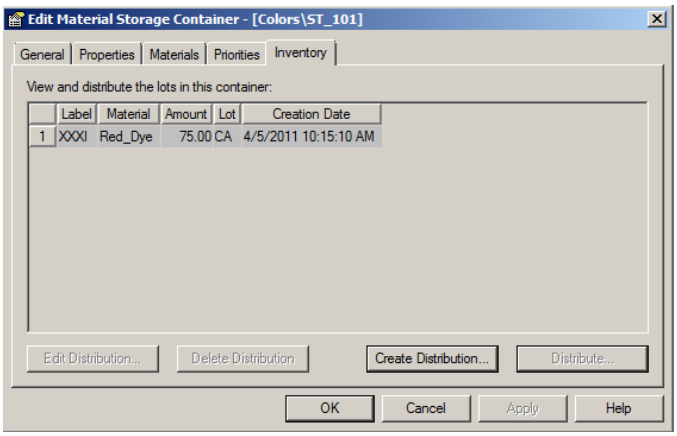
4. Select **New Lot**. Enter '**CD'** for the lot name and '**75'** for the quantity. Click **OK**.



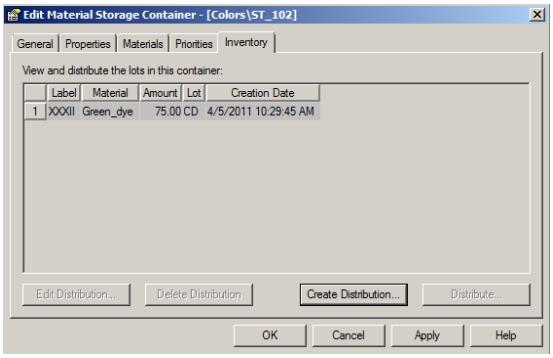
5. Expand the **Material Storage Configuration -> Locations>Colors** folder and double click on **ST_101**.



6. Select the Inventory tab. Delete any existing distributions and create a distribution for Red_Dye per the table above (once again not necessary to delete if pre-configure).



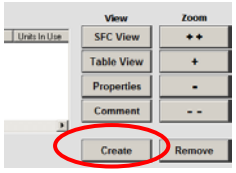
7. Double click on **ST_102** in the **Locations>Colors** folder. Select the Inventory tab. Delete any existing distributions and create a distribution for Green_Dye per the table above.



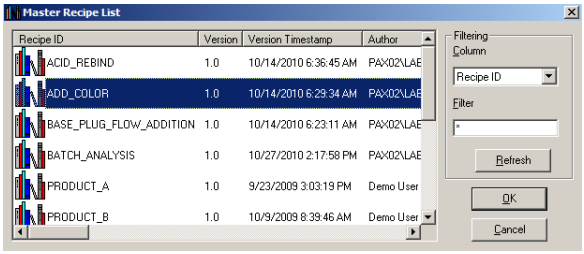
8. Double click on **ST_103** in the **Locations -> Colors** folder. Select the Inventory tab. Delete any existing distributions.

Run the Batch

1. From an HMI on the PASS01 image, select **Batch Premix 1** from the menu bar
2. Click Create

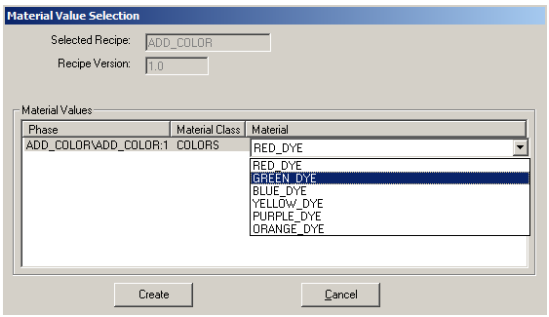


3. Select the **Add_Color** recipe. Click **OK**.

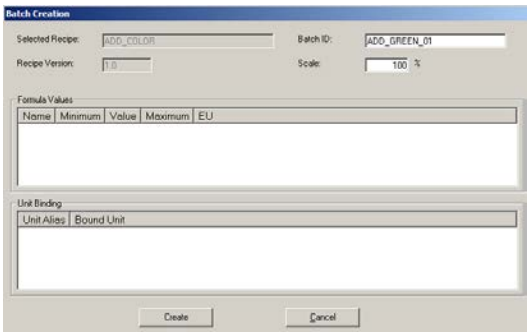


4. Select **GREEN_DYE** from the material drop down list. Click **Create**.

Lab 3: Factory Talk Batch
"Material Manager"



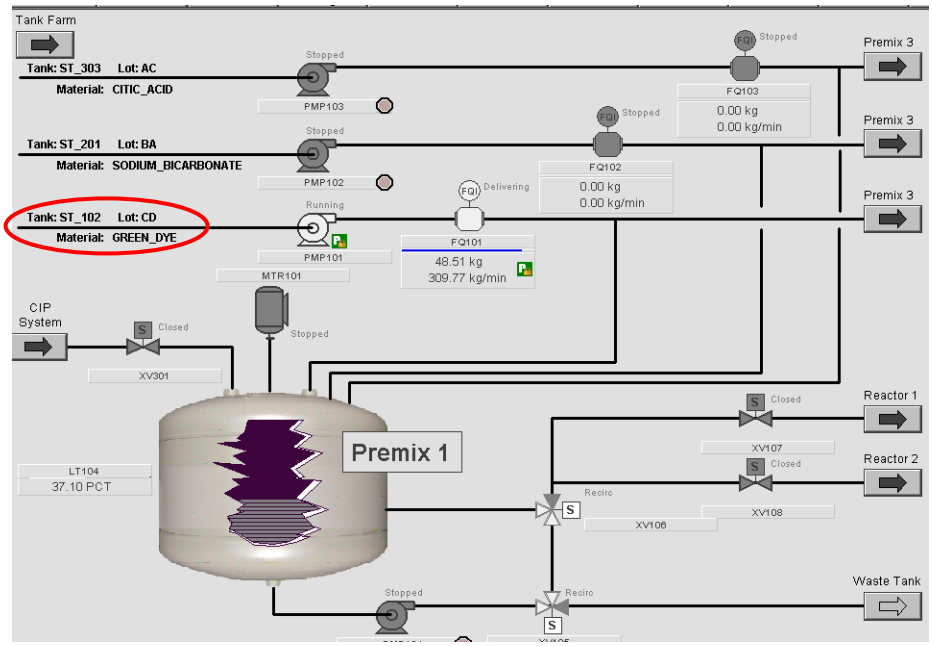
5. Type in a name for the Batch ID. Click **Create**.



6. Start the batch.

Lab 3: Factory Talk Batch
"Material Manager"

7. Note the Tank, Material, and Lot match the configuration table above.



8. Wait for the batch to complete and examine the batch journal if desired.

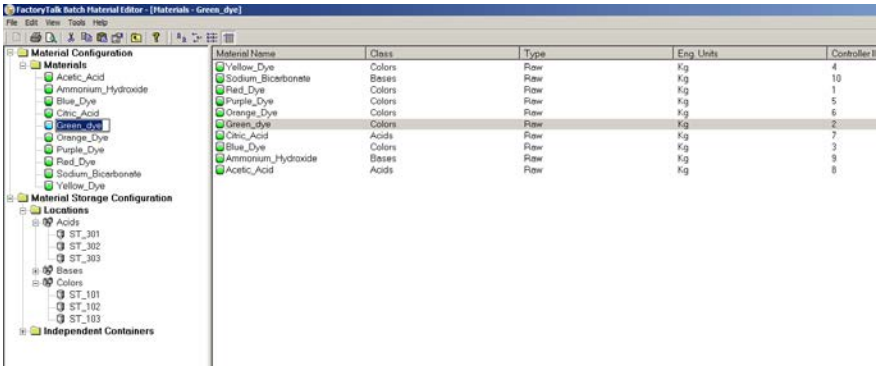
Time	Description	Event Type	Value	Eng. Units	Unit	Phase	U	Unique ID	Material	Material ID	Lot Name	Label	Container
2011.04.05 10:34:00	Material Addition Promised	Material Tracking	60	Kg	PREMIX_01	PM01_AD...		188	GREEN_DYE	2	CD	XXXII	COLORS\ST_102
2011.04.05 10:34:17	Material Addition	Material Tracking	59.9209060668945	ENG. UNI...	PREMIX_01	PM01_AD...		188	GREEN_DYE	2	CD	XXXII	COLORS\ST_102

Lab 3: Factory Talk Batch
"Material Manager"

Inventory Check

Setup

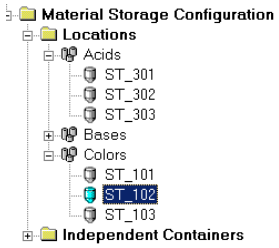
1. On the **AppSerBatch** image, open the Material Editor. (**Start ->** **Material Editor**.)
2. Expand **Material Storage Configuration -> Locations -> Colors**



For this example, the color containers will be configured per the table below:

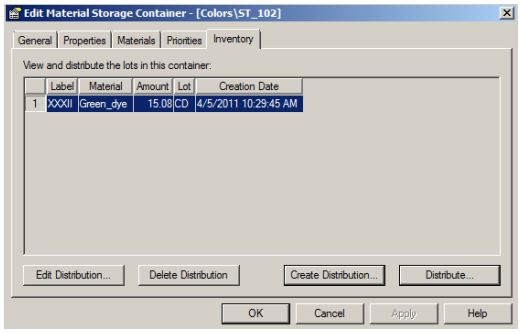
Container	Material	Quantity	Priority	Lot ID	Label
ST101	Red_Dye	75kg	50	CA	XXXI
ST102	Green_Dye	75kg	50	CD	XXXII
ST103	- none -	- -	- -	- -	- -

3. This setup is the same as the setup used in the color tank selection example above. If the inventory was configured for the previous example, the only setup necessary for this example should be to update the quantity of green dye (since 60 Kg were used in the color tank example.) Double click on **ST_102**.

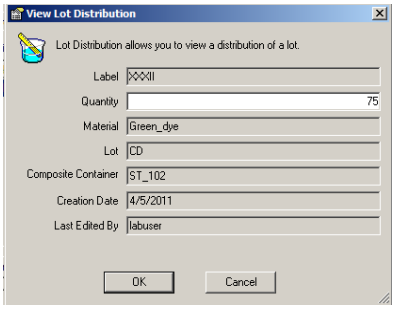


Lab 3: Factory Talk Batch
"Material Manager"

4. Select the **Inventory** tab. Highlight the existing distribution and click **Edit Distribution**.

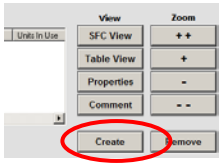


5. Change the quantity to '75'.

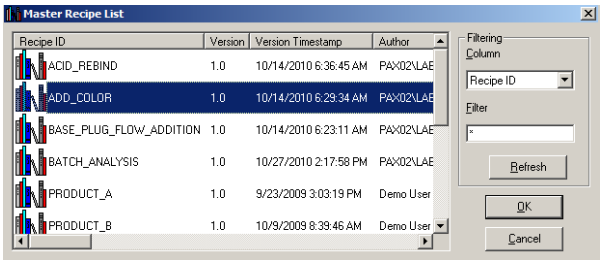


Run the Batch

1. From the HMI on the PASS01 image, select **Batch – Premix 1** from the menu bar
2. Click Create

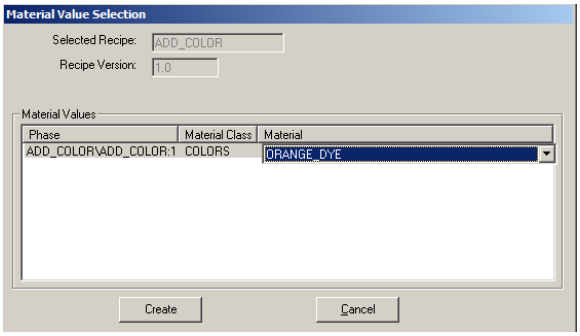


3. Select the **Add_Color** recipe. Click **OK**.



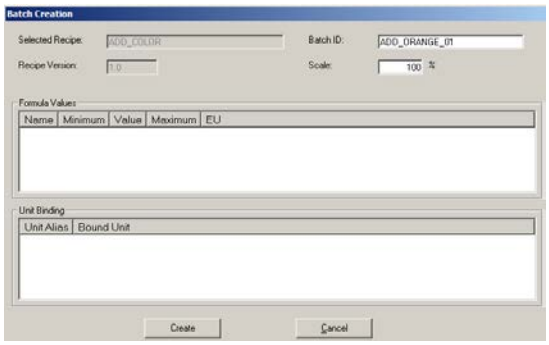
Lab 3: Factory Talk Batch
"Material Manager"

4. Select **ORANGE_DYE** from the material drop down list. Click **Create**.



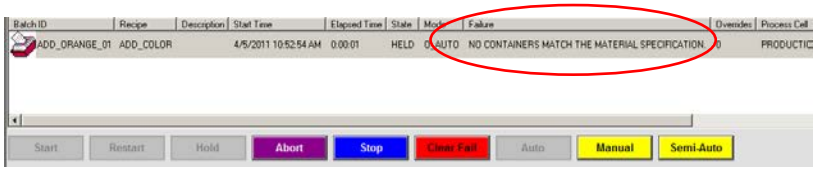
Note: The batch can be setup even though the material is not found in inventory. (New feature of Batch V11, Late Material Binding)

5. Type in a name for the Batch ID.



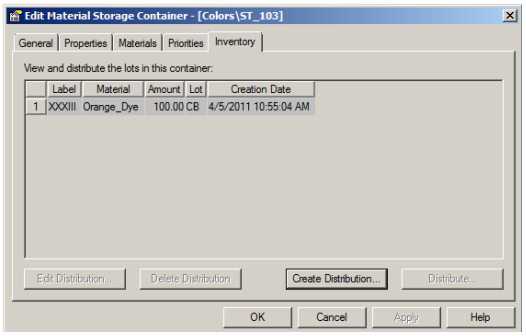
6. Start the batch.

7. The batch will not run because the material cannot be found in inventory.

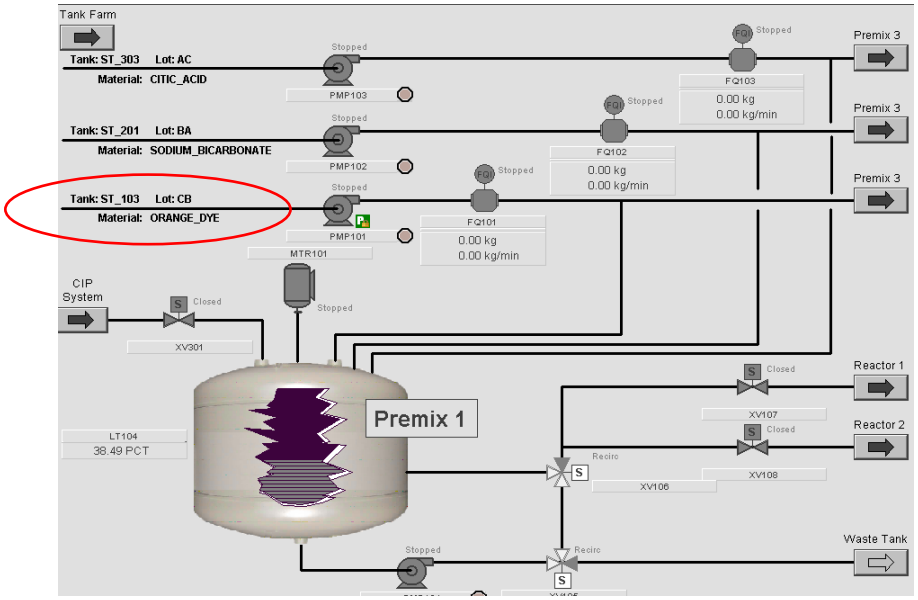


Lab 3: Factory Talk Batch
"Material Manager"

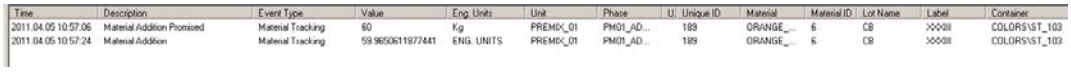
8. From the Material Editor, add "Orange_Dye" to storage tank ST_103. Add 100kg, with a Lot ID = "CB" and Label = "XXXIII." See earlier steps for example on how to do this.



9. Clear the batch fault and restart the batch.
10. The batch proceeds now that Orange_Dye inventory has been found.



11. Wait for the batch to complete and examine the batch journal if desired.



This completes Part 1 of the Material Manager lab.

Lab 3: Factory Talk Batch
"Material Manager"

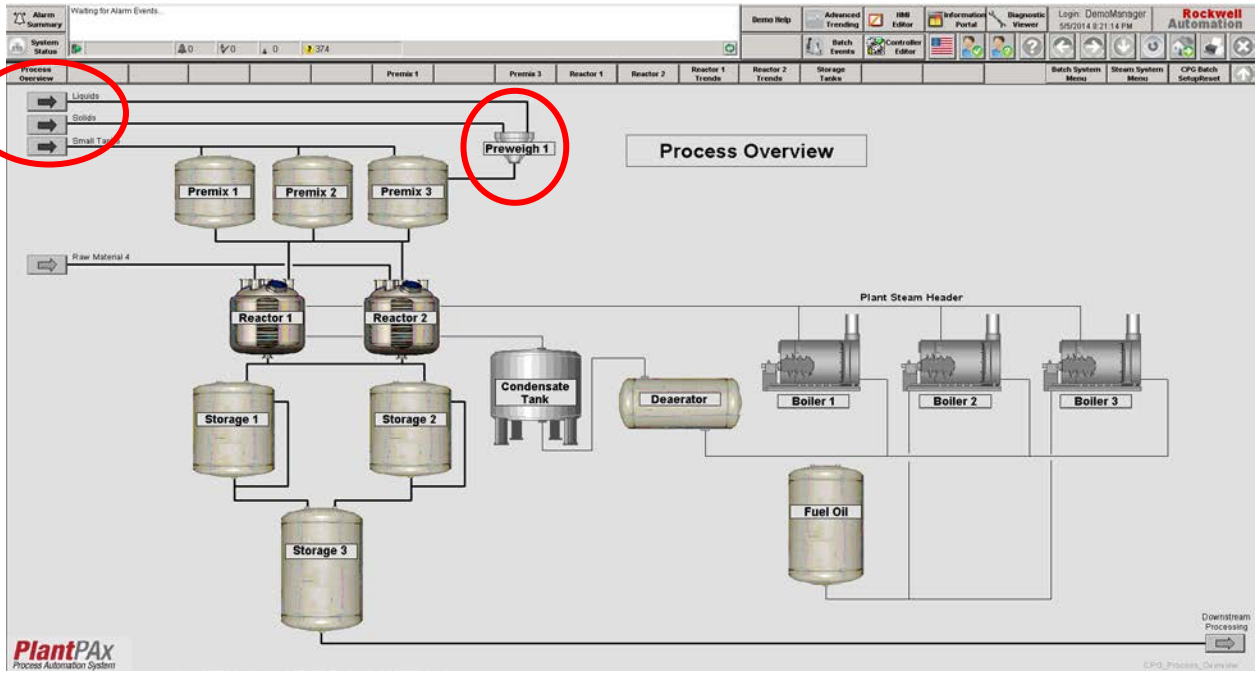
Material Management implementation with FactoryTalk Batch

This part of the lab introduces the material management capabilities of FactoryTalk Batch. It will show how material enabled equipment phases can be used to track material to and from storage locations. The solution demonstrates how the materials database (MicroSoft SQL based) can be accessed from a HMI using product supported ActiveX components, FactoryTalk Batch API's (Application Programming Interfaces), and VBA (Visual Basic for Applications).

The scenario is a truck receiving area where material is unloaded from trucks and loaded into silos and tanks. These storage locations then feed a process Pre-Weigh hopper unit.

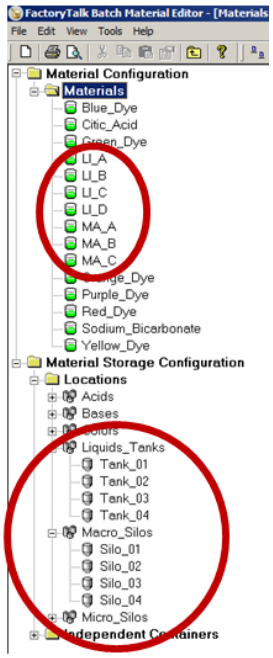
From the Process Overview screen you can navigate to the Raw Material Silos, Raw Materials Tanks and the Pre-weigh Unit used for this example. The Process Overview display can be reached from the

button.

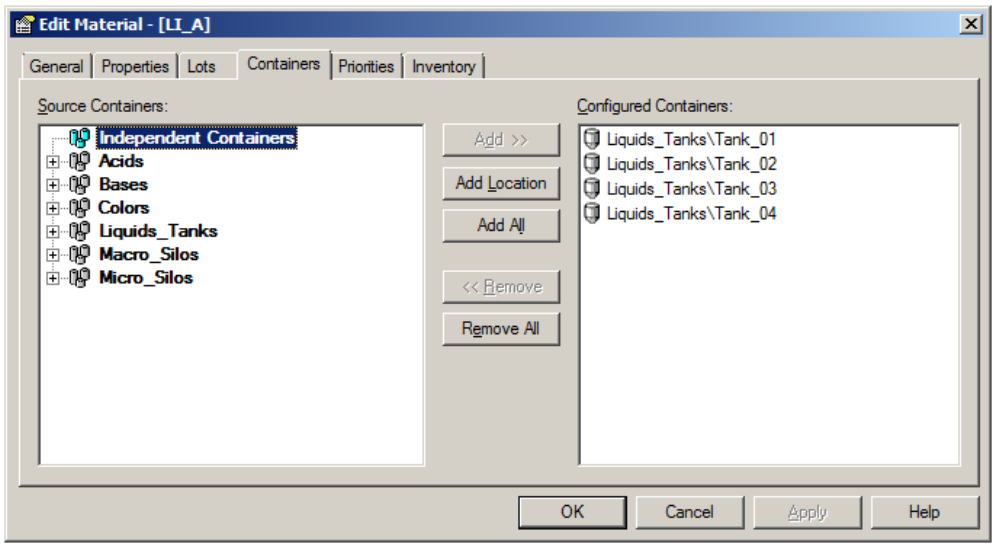


In the FTBatch Material editor we have configured each of the tanks and silos as material storage locations, we have also defined the materials that can be stored in those locations. Open the Material Editor on the AppSerBatch image if you want to following along with screen captures below.

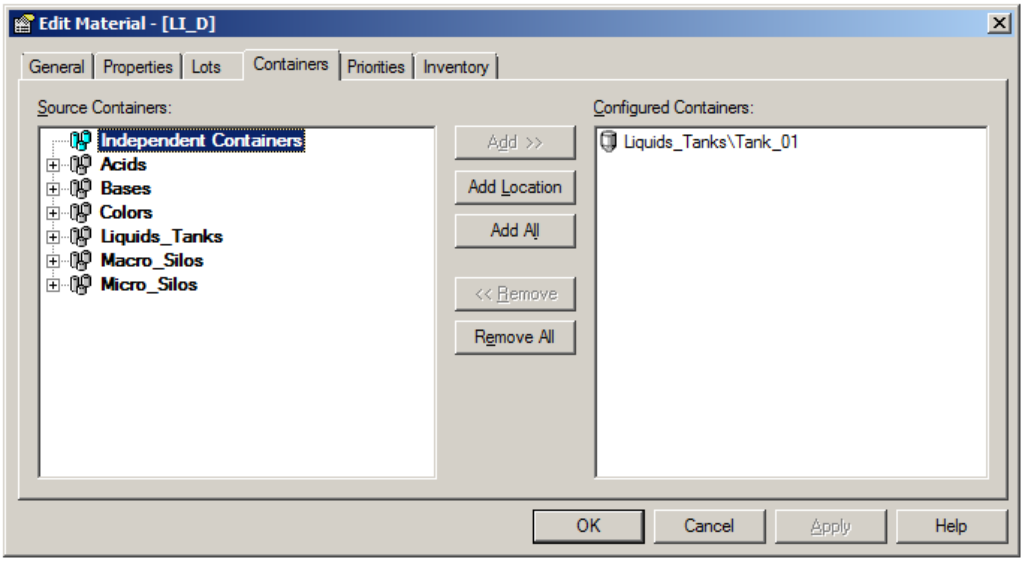
Lab 3: Factory Talk Batch
"Material Manager"



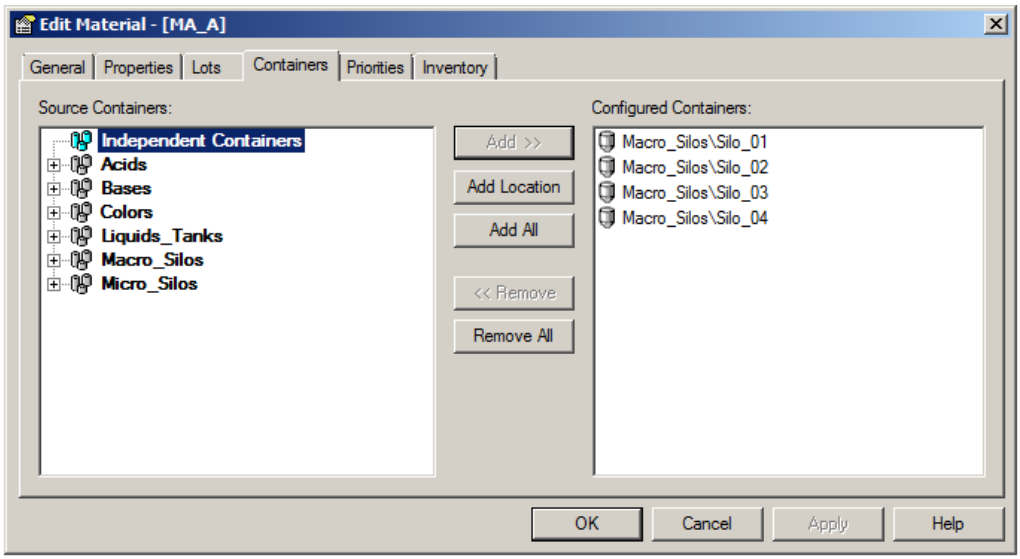
The tanks store liquids, the liquids defined are LI_A, LI_B, LI_C, and LI_D.
All of these materials have been configured to be stored in any of the tanks except LI_D which can only be stored in Tank 01.



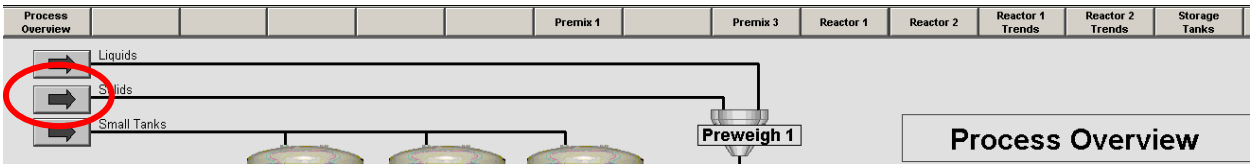
Lab 3: Factory Talk Batch
"Material Manager"



The silos store solids, the solids defined are MA_A, MA_B and MA_C.
Any of these materials can be stored in any silo.



Go back to the PASS01 image and navigate to the Silos display by selecting the "SILOS" button from the Process Overview page.



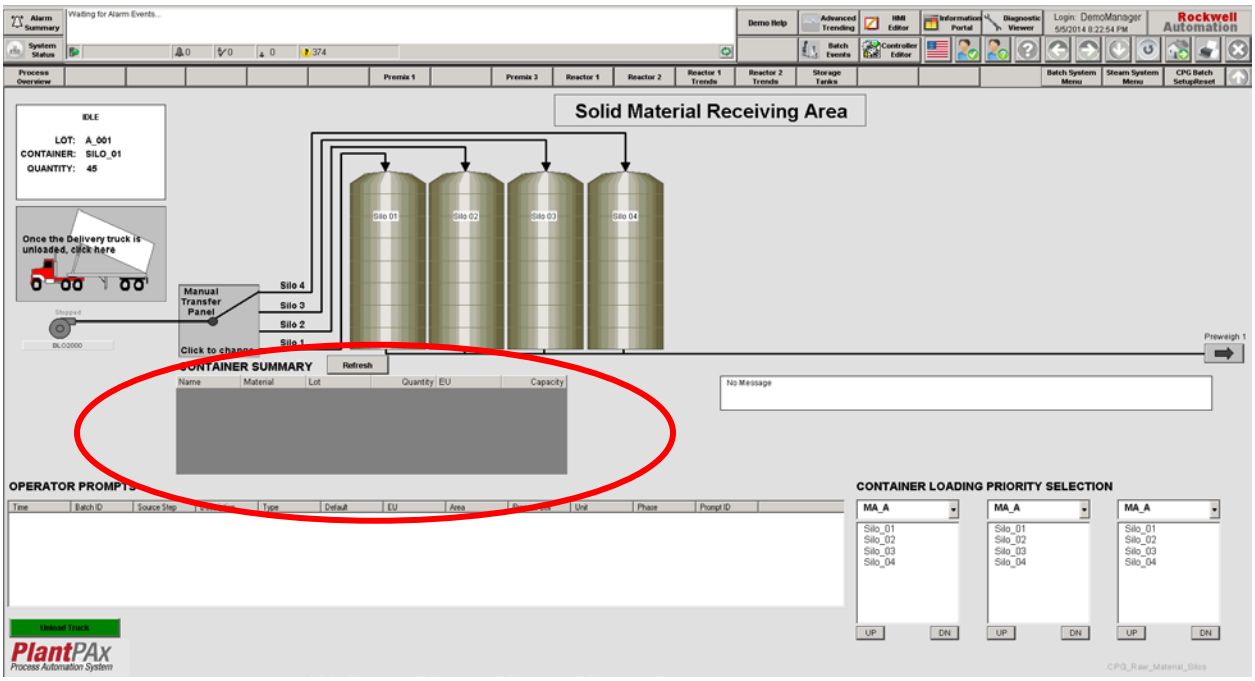
Lab 3: Factory Talk Batch
"Material Manager"

Solid Receiving Area

The following screen shows a method of receiving material into the plant.

Typically, incoming material arrives via truck or train, and the operators refer to an unloading schedule to determine the unload location. Often, unloaded material is tracked by paper work that eventually gets consolidated using manual entry or data transcription.

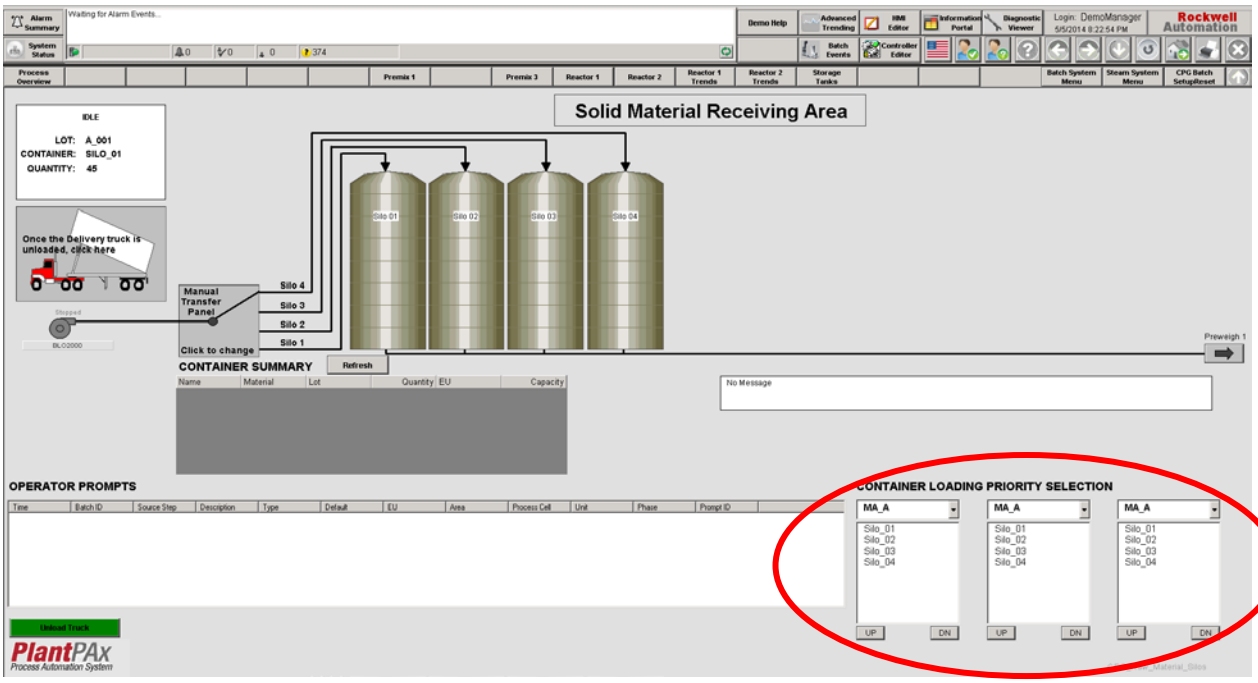
Here we demonstrate how FTBatch Material Manager and a Material Enabled Phase reduce the risk of errors, making the scheduling of silo rotation an electronically driven activity thus improving the overall process.



In this example, we start with empty silos, one can see from the CONTAINER SUMMARY window that no material exists in inventory.

The "CONTAINER LOADING PRIORITY SELECTION" window is used to establish and prioritize incoming material storage locations.
The following display indicates how the list box displays possible locations to store each material. Since there is no inventory, all silos are listed as possible destinations.

Lab 3: Factory Talk Batch
"Material Manager"



Below each "CONTAINER LOADING PRIORITY SELECTION" box are buttons used to change the loading priority. In this example, the priorities, first to last, for material MA_A are Silo 01 followed by 02, 03 and 04. If, during loading, a silo is filled, (as determined in the phase logic) then the system automatically finds the next configured silo for loading.

This example represents a process where the operator sets up the destination path using a transfer panel.

A truck button toggles the presence of a truck in the unloading area. If the truck is removed during the transport process, the system will continue to run for 30 seconds at which time the transport system will stop and the unloading sequence will complete.

The operator will be required to enter the total amount of material unloaded from the truck or trucks.

Lab 3: Factory Talk Batch
"Material Manager"

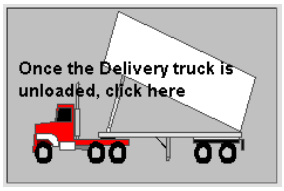
To start the truck unloading sequence, the UNLOAD TRUCK button is enabled. Once this button is selected the system automatically starts an operation containing a material enabled phase.

The material enabled phase prompts the operator for the material to be unloaded and the associated lot ID. Once material and log ID are confirmed, the transport system will start.

If the transfer panel is not setup properly the system will prompt the operator to check the path. The required path is indicated in the phase summary box located in the top left corner of the display. To change the destination, click on the transfer panel. The system will prompt if no possible destination is available.

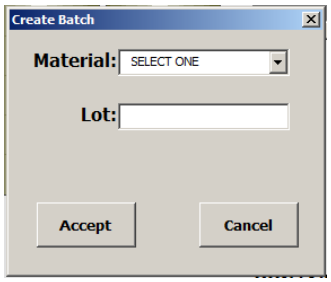
Let's begin by unloading a truck of material MA_A.

Click the TRUCK PRESENT box to indicate that a truck has arrived.



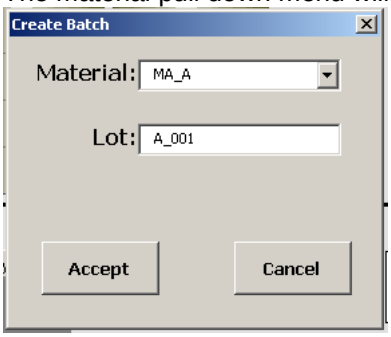
Select the button to start the sequence.

The popup will require you to select the material and enter a Lot ID;



Select MA_A and enter A_001 for the lot ID, then **ACCEPT**.

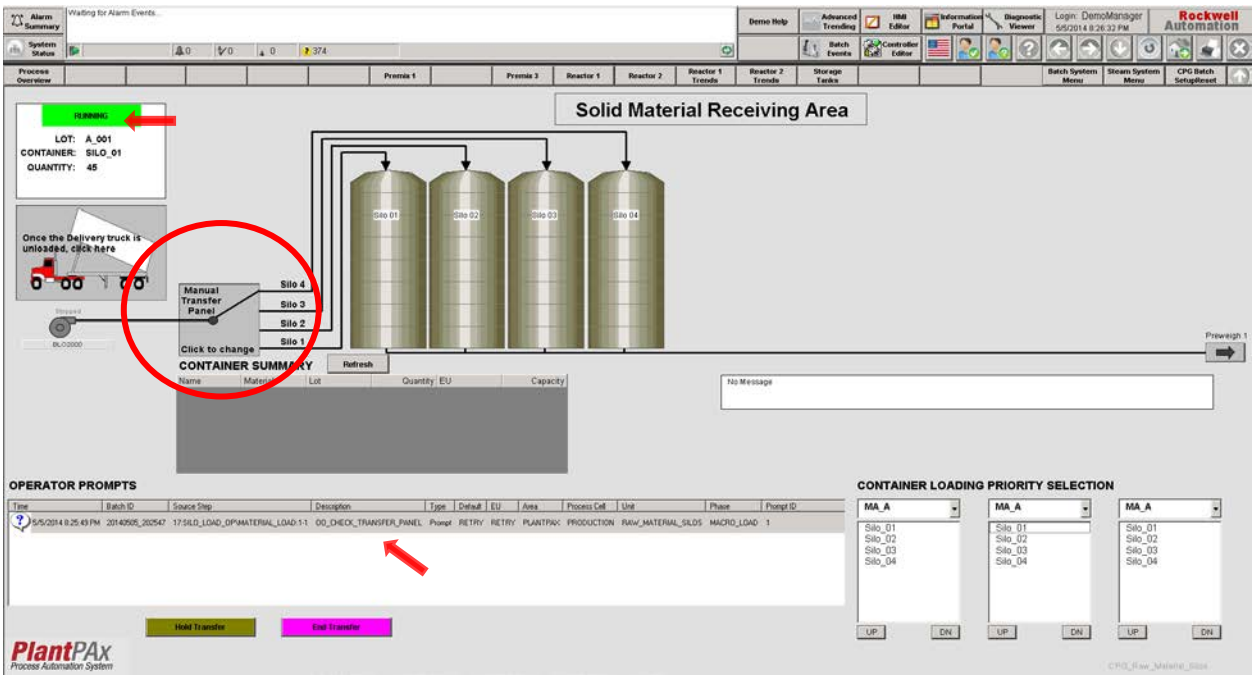
The material pull down menu will only display materials that have been defined in the material editor.



Lab 3: Factory Talk Batch
"Material Manager"

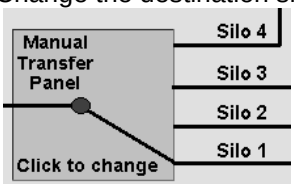
Note that the phase information, located on the top left corner of the display, now indicates that the unloading system or phase is running, but the transport system has not started. This is because, according to the container loading priority selection schedule, the required destination is Silo 01 but the transfer panel is set to Silo 04.

1



Because the required destination is different from the selected one, the system is displaying a prompt to the operator in the OPERATOR PROMPTS window.

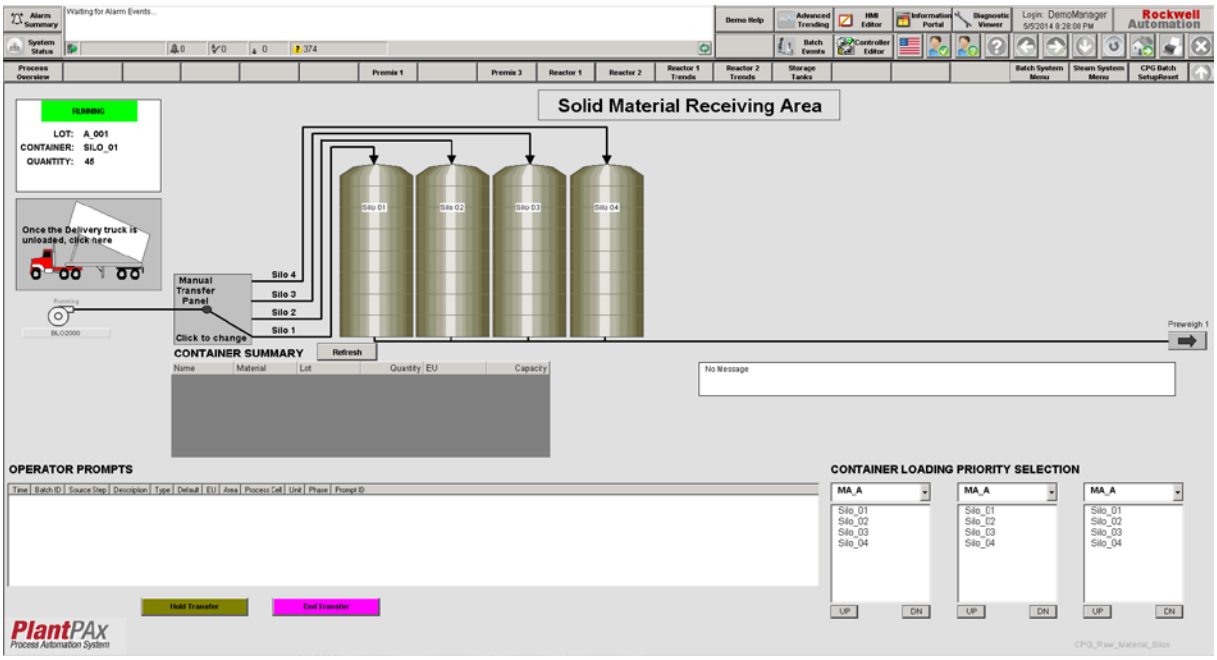
Change the destination silo by clicking on the transfer pane.



After correcting the transfer panel destination, double-click on the prompt and select, "Retry" to continue with truck unloading.

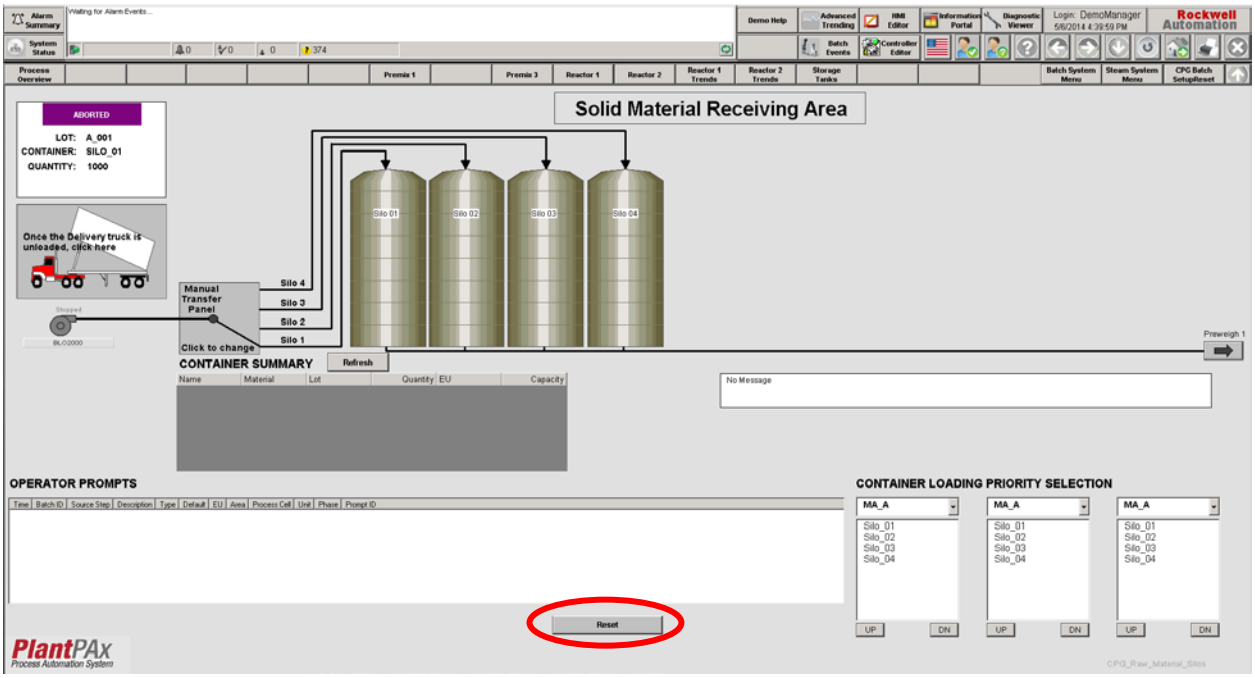
The system will now indicate that the transport system is running.

Lab 3: Factory Talk Batch
"Material Manager"



This will continue until the truck is removed using the truck present button. If no other truck is present in the next 30 seconds, the system will assume there is no more material to unload and complete. Another way to complete is to select the END TRANSFER button.

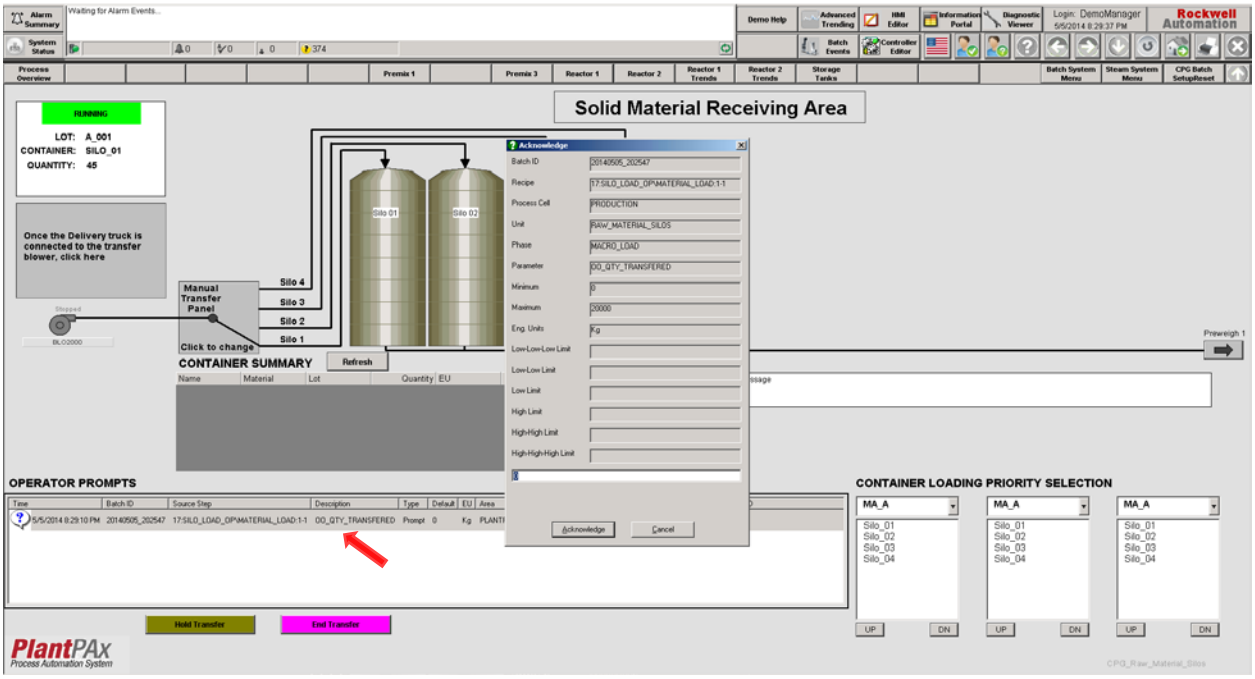
Additionally, material transport can be held and restarted using buttons located below the OPERATOR PROMPTS window.



Lab 3: Factory Talk Batch
"Material Manager"

Once the unloading process has ended, the operator must input the unloaded material quantity, using another operator prompt.

Note: an operator entry is required in this scenario. If the unloaded amount can be captured using a flow meter or perhaps from truck tare weight then operator prompting can be omitted.

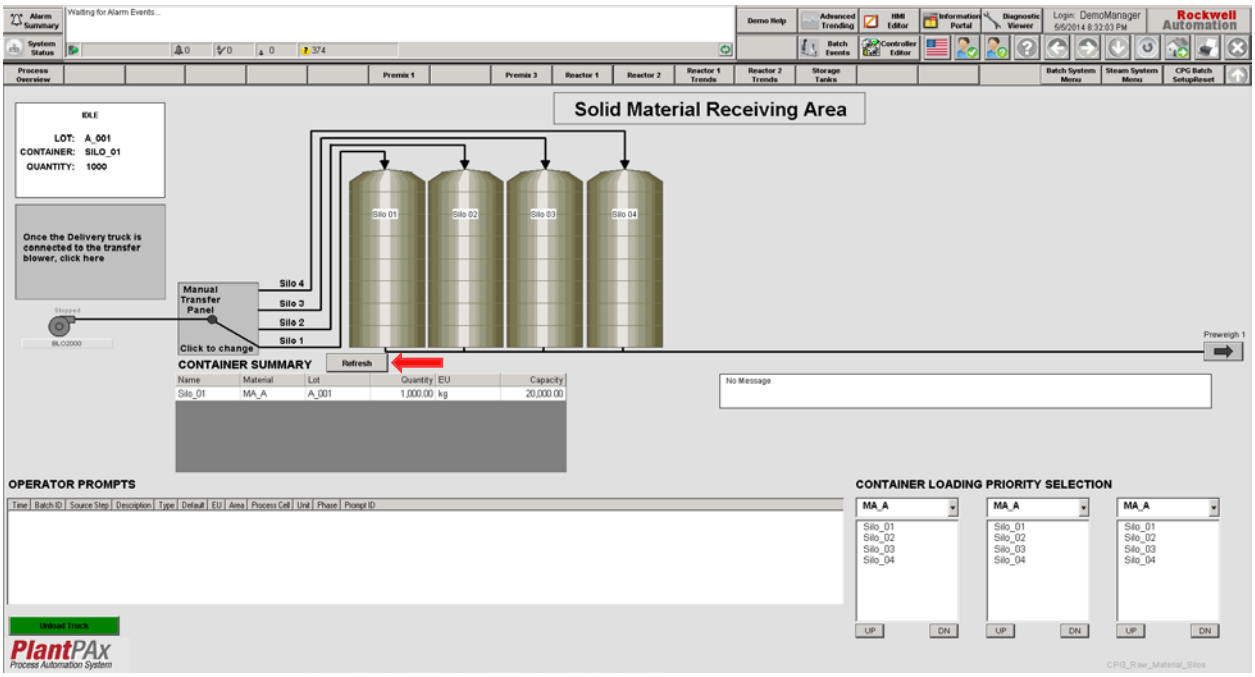


Double-click the prompt and enter the amount. For this example let's enter an amount of **1000** Kg.

Select the **RESET** button below the Operator Prompts window if you selected the End Transfer button.

Selecting the REFRESH button updates inventory in the CONTAINER SUMMARY window. Please see the following screen capture.

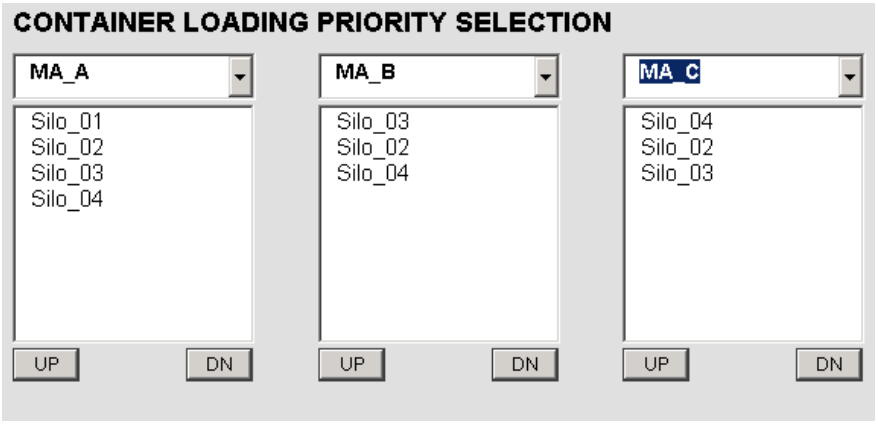
Lab 3: Factory Talk Batch
"Material Manager"



We can now see in the CONTAINER SUMMARY window that Silo 01 contains 1000 Kg. of material MA_A with a Lot ID of A_001.

Reviewing the "CONTAINER LOADING PRIORITY SELECTION" we see that:
Material MA_A can be loaded into any silo.
Material MA_B and MA_C can only be loaded into Silos 02, 03 or 04, since material MA_A is in Silo 01.

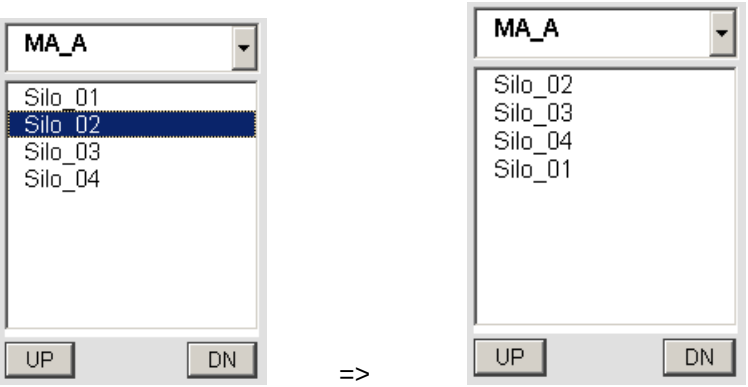
Material Manager has reserved Silo 01 for material MA_A. This feature prevents the loading of dissimilar materials into the same container.



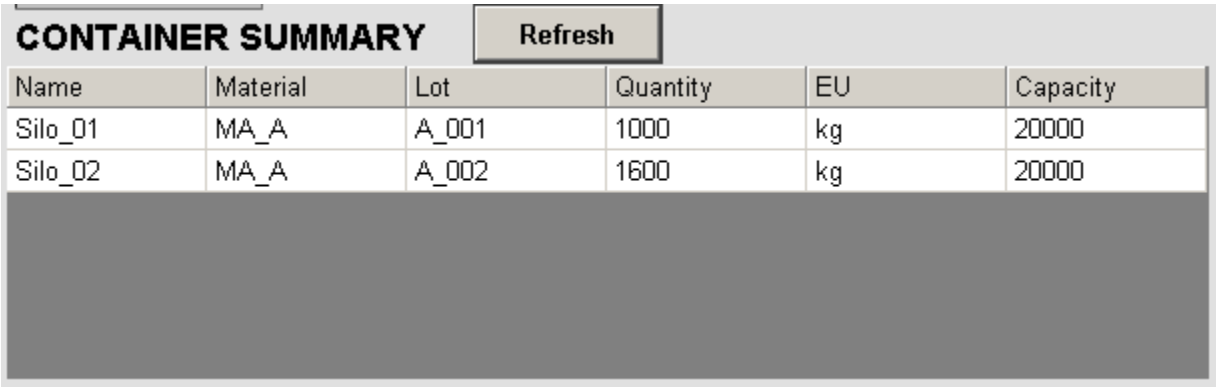
Let's receive a new lot of material MA_A but send it to Silo 02. To do so, requires changing Silo 02's container priority.

From the table listing MA_A select Silo 02 then select the **UP** button. Silo 02 is now the next silo for receiving this material.

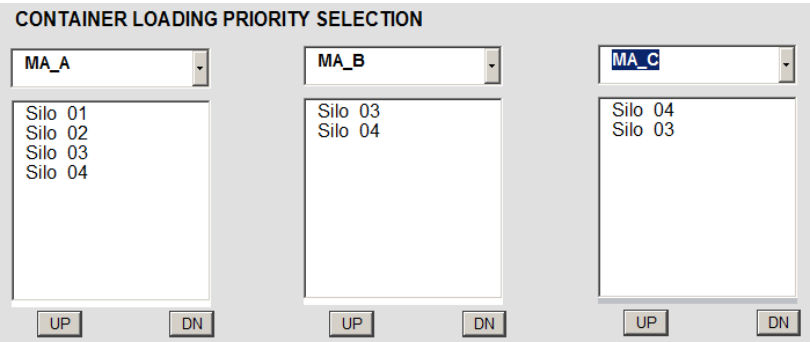
Lab 3: Factory Talk Batch
"Material Manager"



Follow the previously established procedure to unload 1600 Kg. of MA_A to Silo 02 with a lot ID of A_002. Select the REFRESH button to update inventory.



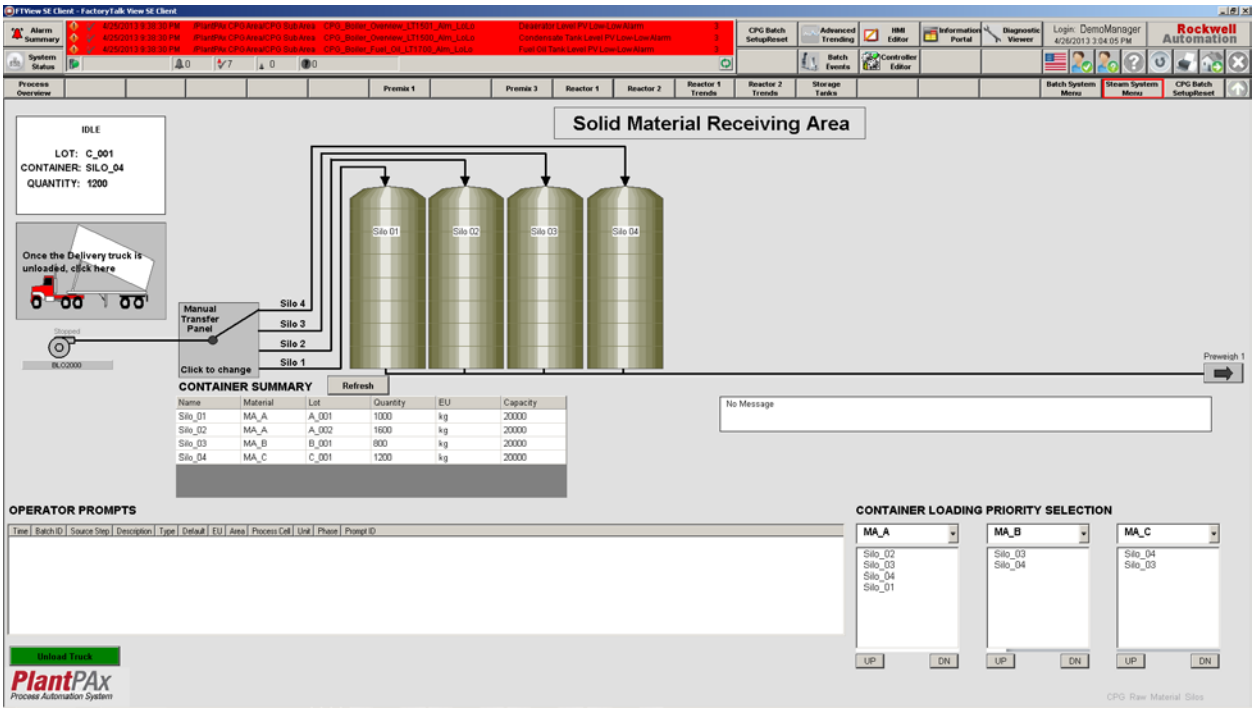
Silo 01 and 02 will not be available to unload any other material other than MA_A.



Repeat this process to add:
800 Kg. of MA_B to Silo 03 with a Lot ID of B_001
1200 Kg. of MA_C to Silo 04 with a Lot ID of C_001

Refresh the display to review the Container Summary window.

Lab 3: Factory Talk Batch
"Material Manager"



If another truck of material MA_B needs to be unloaded, it can only be delivered to Silo 03.

Receive another 500 Kg. of MA_B with a Lot ID of B_002.

CONTAINER SUMMARY Refresh

Name	Material	Lot	Quantity	EU	Capacity
Silo_01	MA_A	A_001	1,000.00	kg	20,000.00
Silo_02	MA_A	A_002	1,600.00	kg	20,000.00
Silo_03	MA_B	B_001	1,300.00	kg	20,000.00
Silo_04	MA_C	C_001	1,200.00	kg	20,000.00

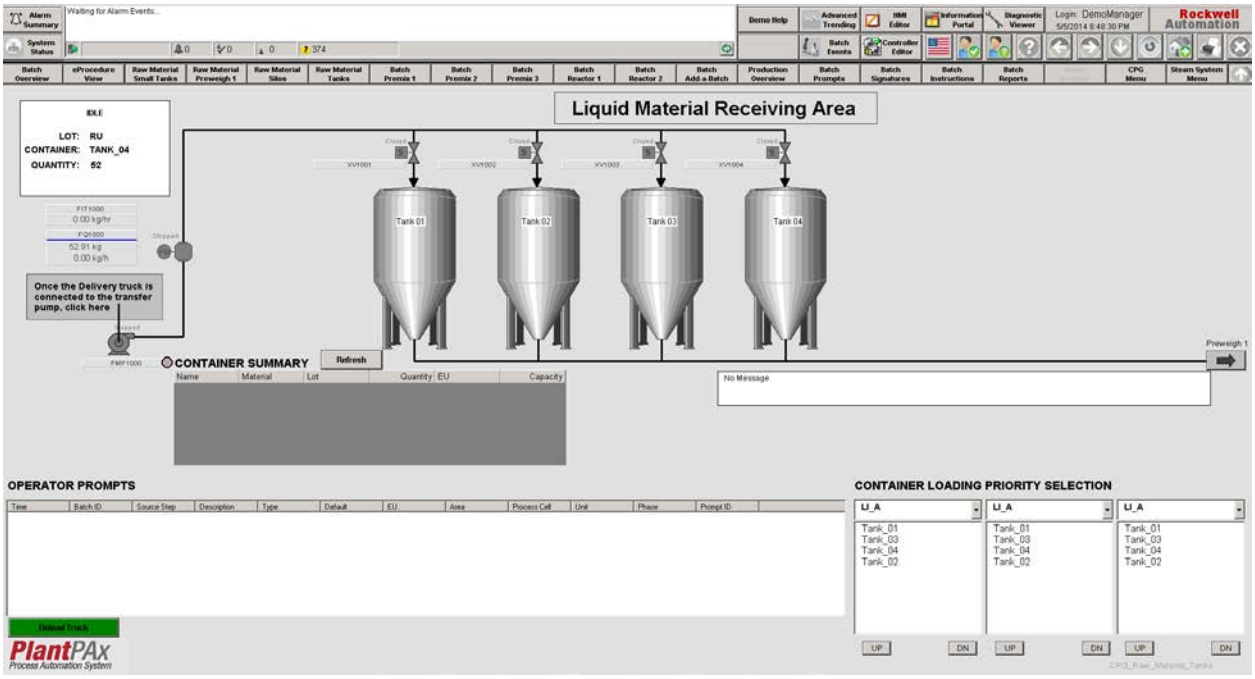
The Lot ID indicated in Silo 03 reflects the lot of the material at the bottom of the silo since it is a Plug Flow type container and materials are not mixed.

Liquid Receiving Area

Liquid receiving operates under the same philosophy as solids, but utilizes a flow meter which provides automatic inventory updates. Inventory is updated when the operator indicates that the transfer is complete.

Lab 3: Factory Talk Batch
"Material Manager"

From the menu bar select **Batch System Menu** then **Raw Material Tanks** to go to the Liquid Receiving Area.



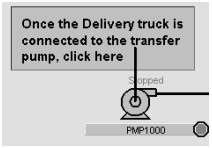
Create an inventory of liquids using materials Liquids LI_A, LI_B, LI_C and LI_D

Remember that we are able to isolate possible destinations or containers for each material, in this example material LI_A can only go into Tank 01.

Create some inventory of the following (approximate amount):

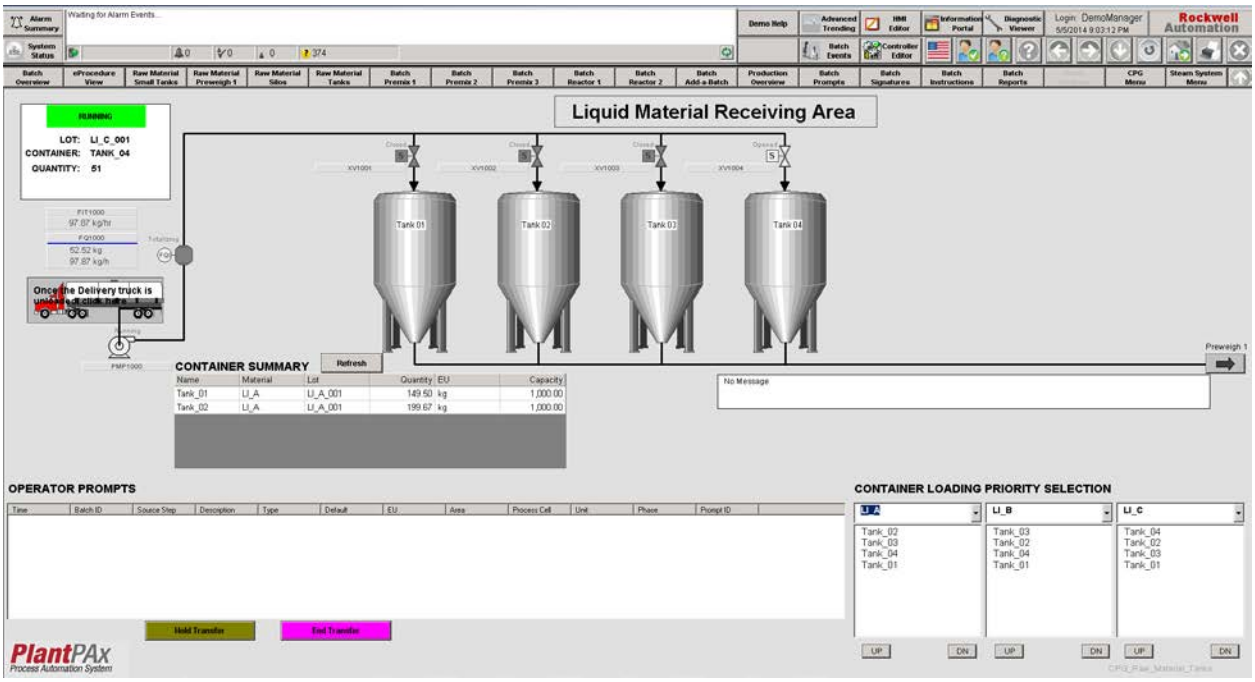
Container	Material	Quantity - Kg	Lot ID
Tank 01	LI_A	150	LI_A_001
Tank 02	LI_A	200	LI_A_001
Tank 03	LI_B	200	LI_B_001
Tank 04	LI_C	200	LI_C_001

Note that the priority can be set in advance; this is often performed by the operations department. Simulate the presence of a truck by clicking the following button.

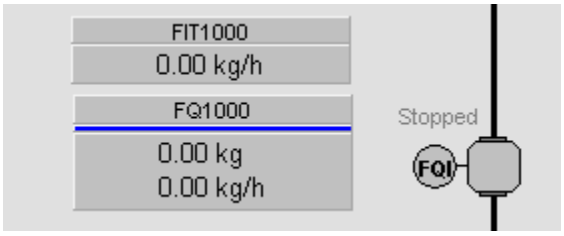


Note that a truck is now shown in the receiving area:

Lab 3: Factory Talk Batch
"Material Manager"



The amount of material transferred in this system is totalized using an in line totalizer.



When the approximate material required has been added, end the unloading sequence by selecting

Select the **REFRESH** button to update the inventory, which can be seen in the CONTAINER SUMMARY window.

Remember to change the priority of the destination container (tank or silo) when necessary.

We have now created an inventory of bulk liquids and solids.

Lab 3: Factory Talk Batch
"Material Manager"

CONTAINER SUMMARY Refresh

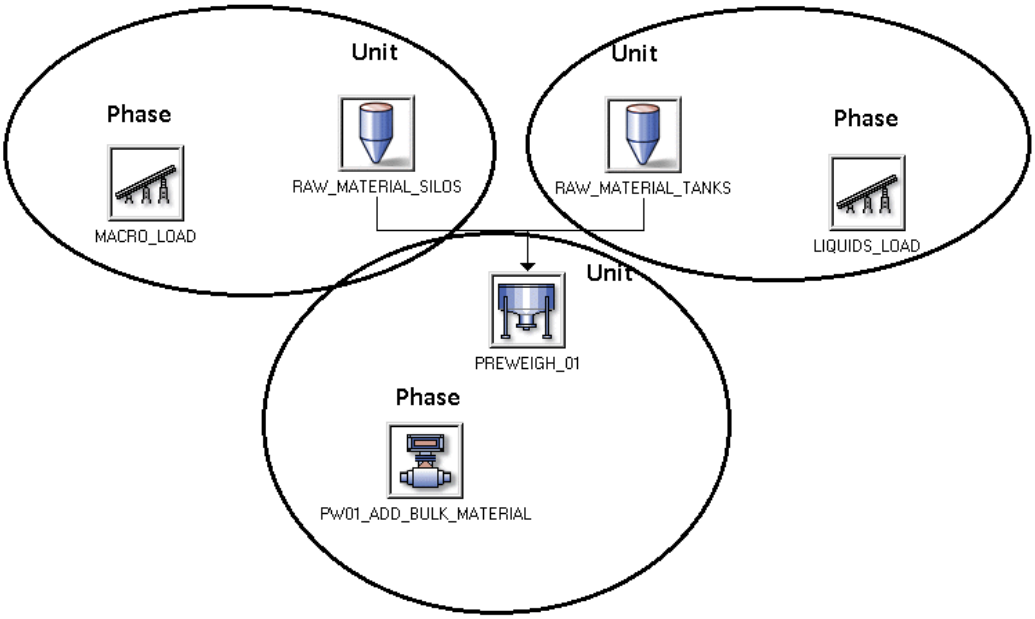
Name	Material	Lot	Quantity	EU	Capacity
Tank_01	LI_A	LI_A_001	160.60	kg	1,000.00
Tank_02	LI_A	LI_A_001	254.88	kg	1,000.00
Tank_03	LI_B	LI_B_001	204.36	kg	1,000.00
Tank_04	LI_C	LI_C_001	252.19	kg	500.00

Lab 3: Factory Talk Batch
"Material Manager"

Pre-Weigh 1

The previous sections unloaded materials into containers. Now we will consume these materials in the Pre-Weigh.

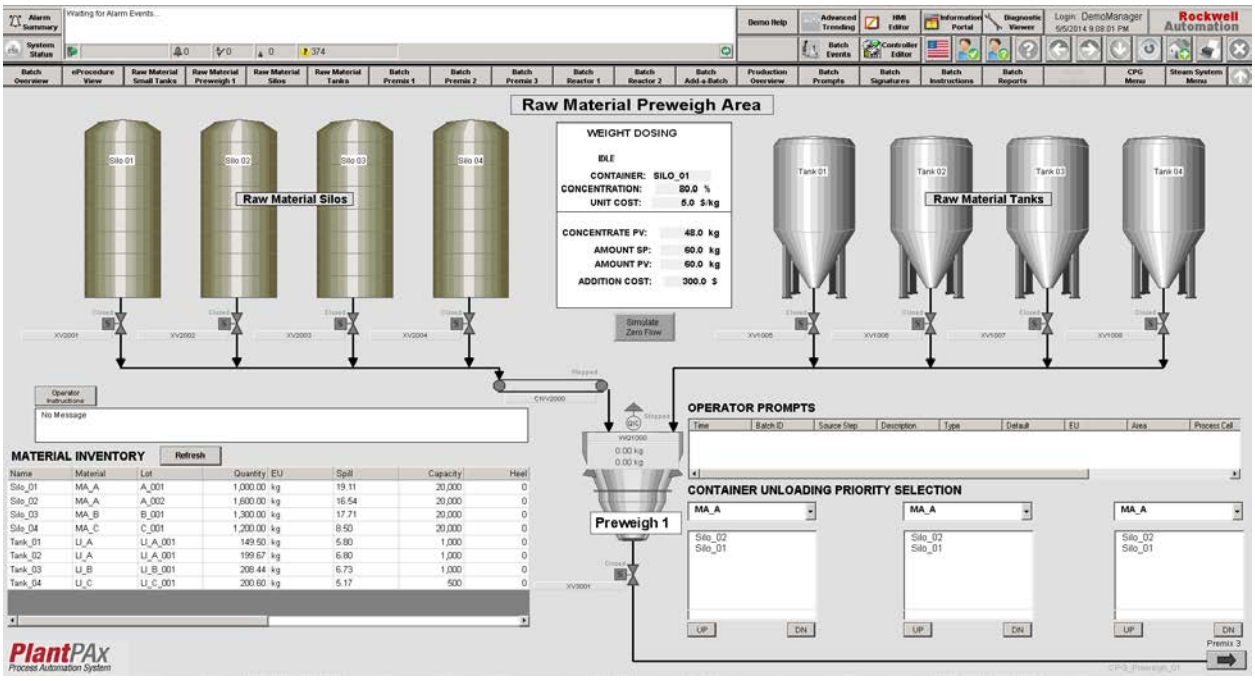
Note: unloading and consumption functionality requires only one Equipment Phase per unloading unit as seen in this screen capture from the FTBatch Equipment Editor.



Lab 3: Factory Talk Batch
"Material Manager"

Batch #1

Navigate to the PREWEIGH unit display by selecting the **Raw Material Preweigh 1** button.



The Pre-Weigh 01 unit has the ability to add materials from any of the storage silos and tanks.

The material additions are totalized in the weigh hopper via load cells.

Material Manager will be responsible for determining the source of these materials based on the criteria specified in the "CONTAINER UNLOADING PRIORITY SELECTION."

The system will update storage container inventory as material is consumed by the process.

Take a moment and examine the PREWEIGH unit display which presents:

- a MATERIAL INVENTORY window
- CONTAINER UNLOAD PRIORITY SELECTION windows
- an OPERATOR PROMPTS window, used by the system when operator intervention is required
- Pre-Weigh Hopper weigh status
- a Unit "Activity Display" to inform the users of process activities. (No Message if inactive).

The Material Addition phase has two operating control strategies. When using Strategy "A" one specifies an explicit amount of material (i.e. Kg). Strategy "B" calculates the material quantity needed based on a material property.

Note: An example of Strategy "B" might be calculating the amount of milk to add based on the shipment's fat content. Since the fat content changes with each shipment, a new quantity is required. Property values, such as fat content, can be stored in Material Manager as Lot attributes.

Lab 3: Factory Talk Batch
"Material Manager"

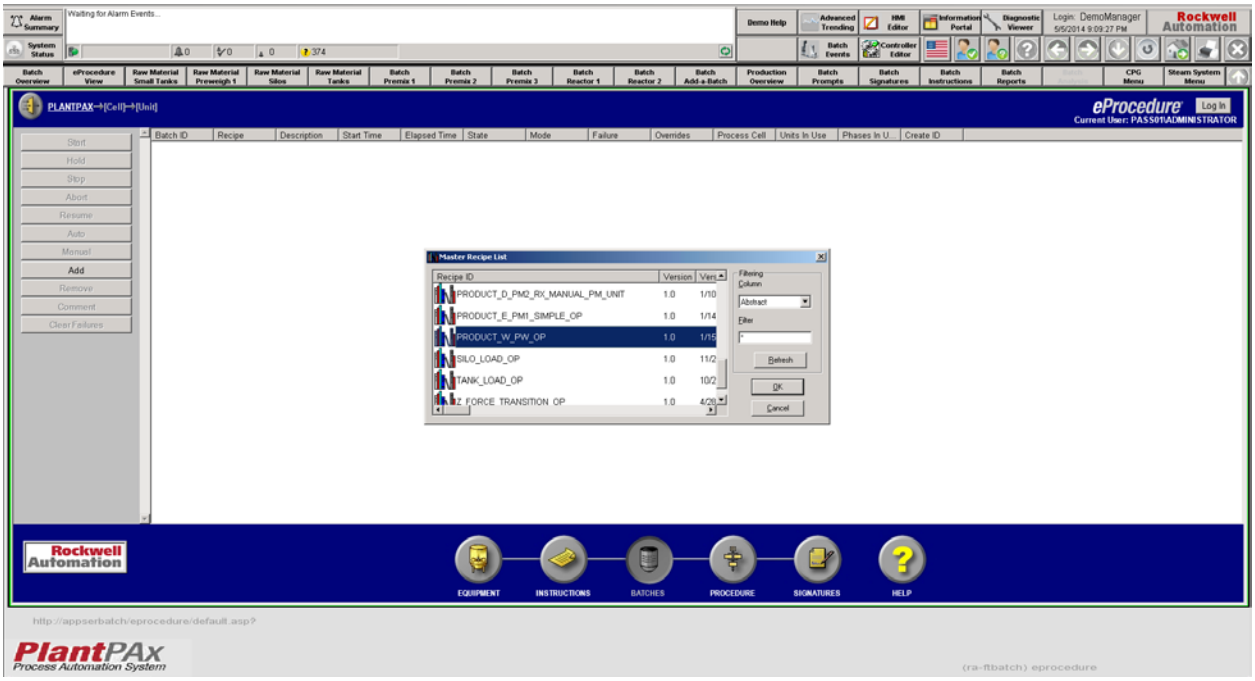
A recipe, PRODUCT_W_PW_OP, has been created to add the following to the Pre-Weigh hopper:

Material	Strategy	Quantity – Kg	Unit / Unit
LI_A	Explicit	50	
LI_B	Implicit		50
MA_A	Implicit		50

Note: Implicit is based on a specific lot's material concentration.

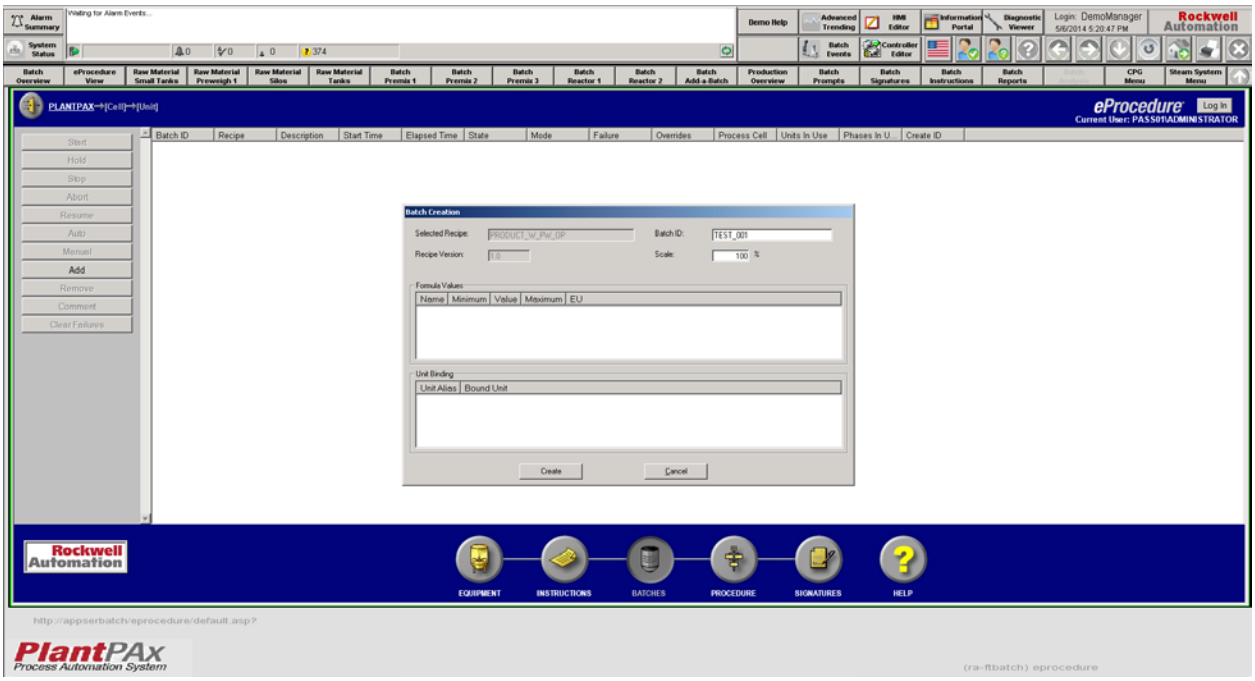
Open the eProcedure View by selecting:

Select **ADD** a batch and select the recipe named "PRODUCT_W_PW_OP." Select **OK**.

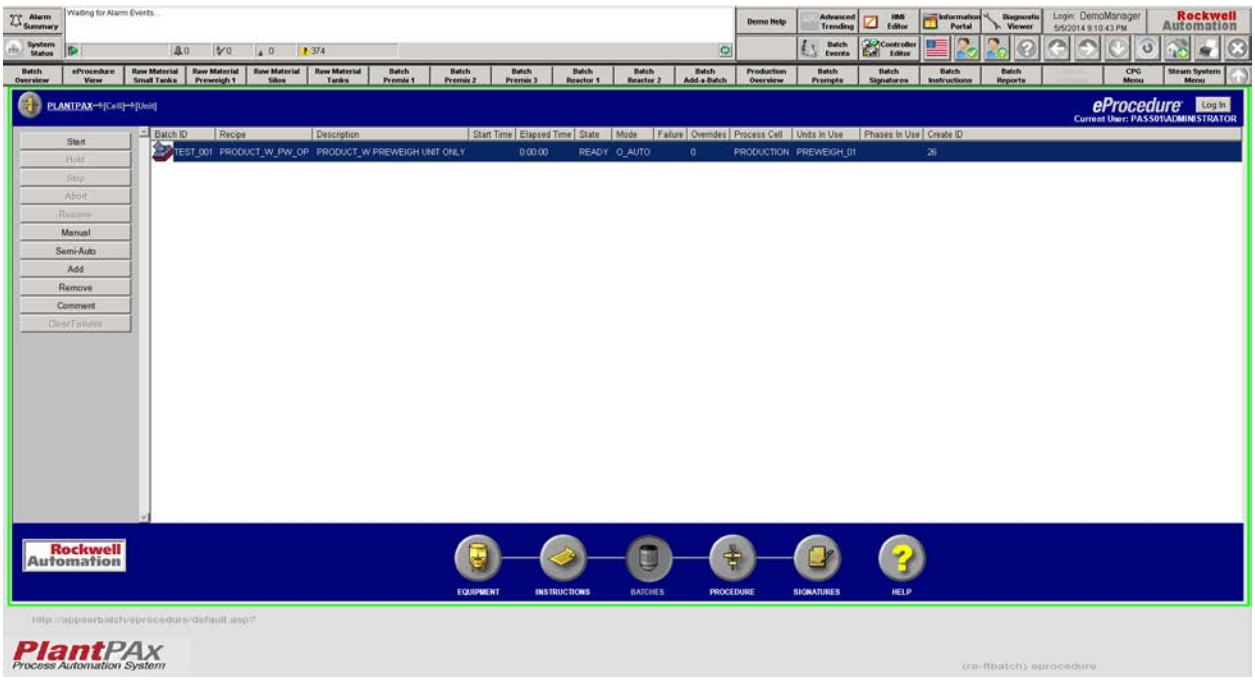


Lab 3: Factory Talk Batch
"Material Manager"

Fill in the Batch ID field. Use: TEST_001 or any other name.

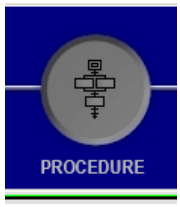


A batch will be placed on the Batch List.

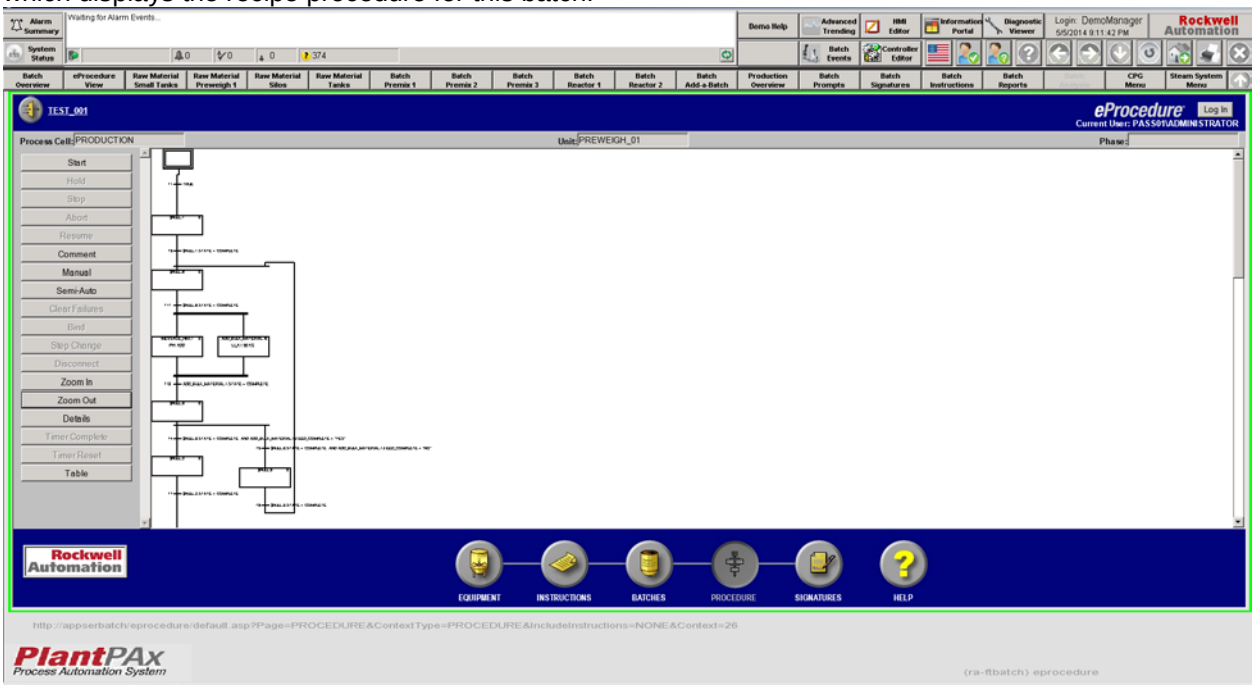


To view the recipe steps and batch status select the **PROCEDURE** button at the bottom of the screen,

Lab 3: Factory Talk Batch
“Material Manager”



which displays the recipe procedure for this batch.

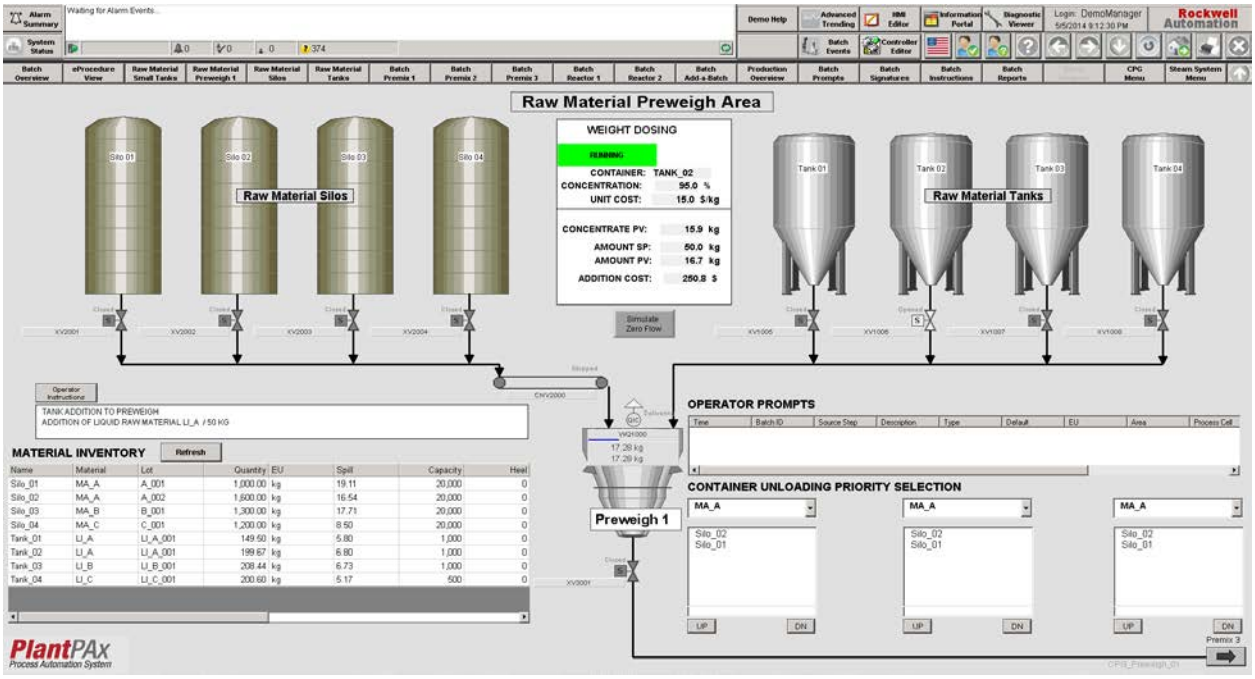


Select the batch from the Batch List and then select **Start** to initiate the batch.

Navigate to the Pre-Weigh unit and watch as the recipe configured materials are added to the batch.

Lab 3: Factory Talk Batch
"Material Manager"

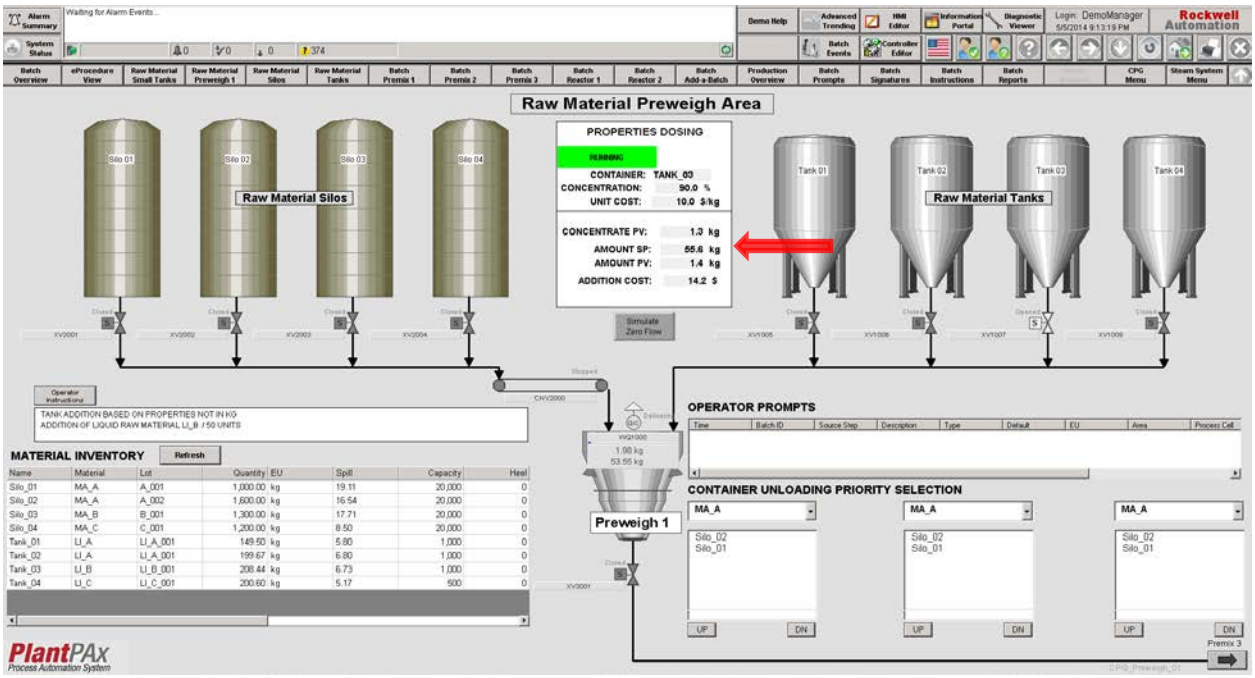
You may recall that 50 Kg of liquid LI_A is to be added. Based on where this material is stored and the usage priorities, the material should be taken from Tank 02 as shown on the following display.



Lab 3: Factory Talk Batch
"Material Manager"

Recall the second addition is liquid LI_B. Inventory and priority dictates Tank 03 will be used. Also recall, the recipe specified the addition of 50 units of material based on concentration. This material lot has a 90% concentration, from which the system calculates a required addition amount of 55.6 Kg.

The properties and setpoints are displayed on the PROPERTIES DOSING section of the display.

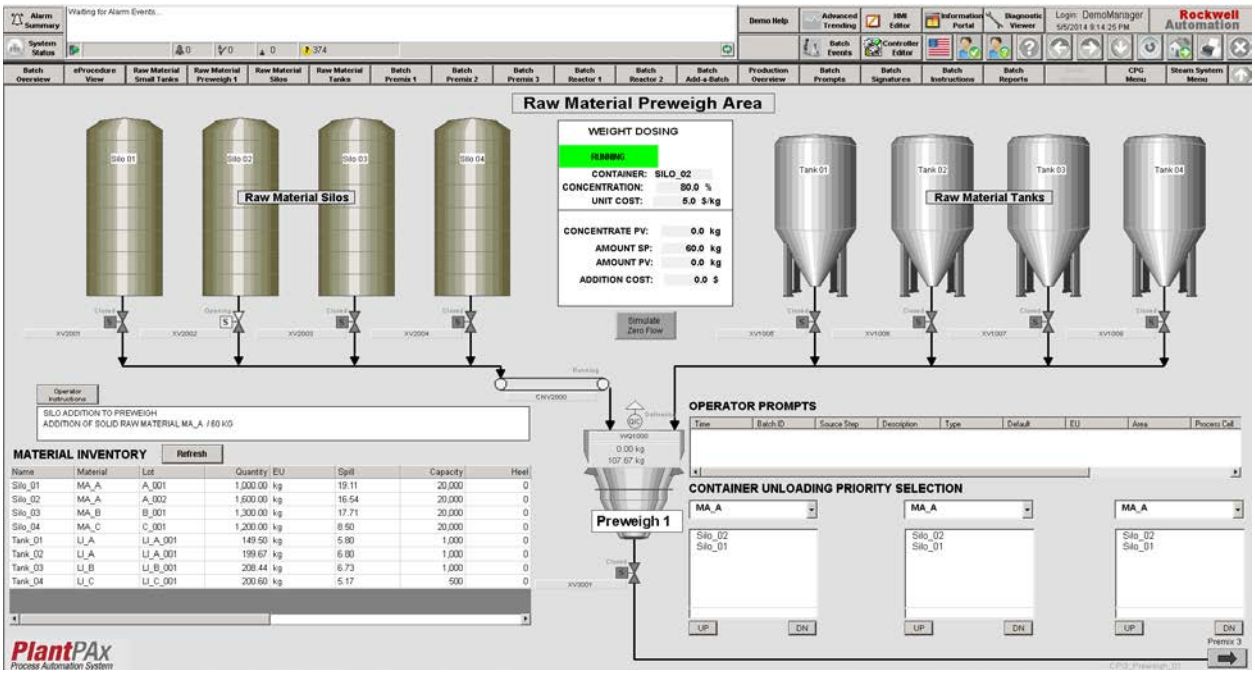


Lab 3: Factory Talk Batch
"Material Manager"

The third addition is a solid material, MA_A. This material will be taken from Silo 02, based on storage locations and priorities.

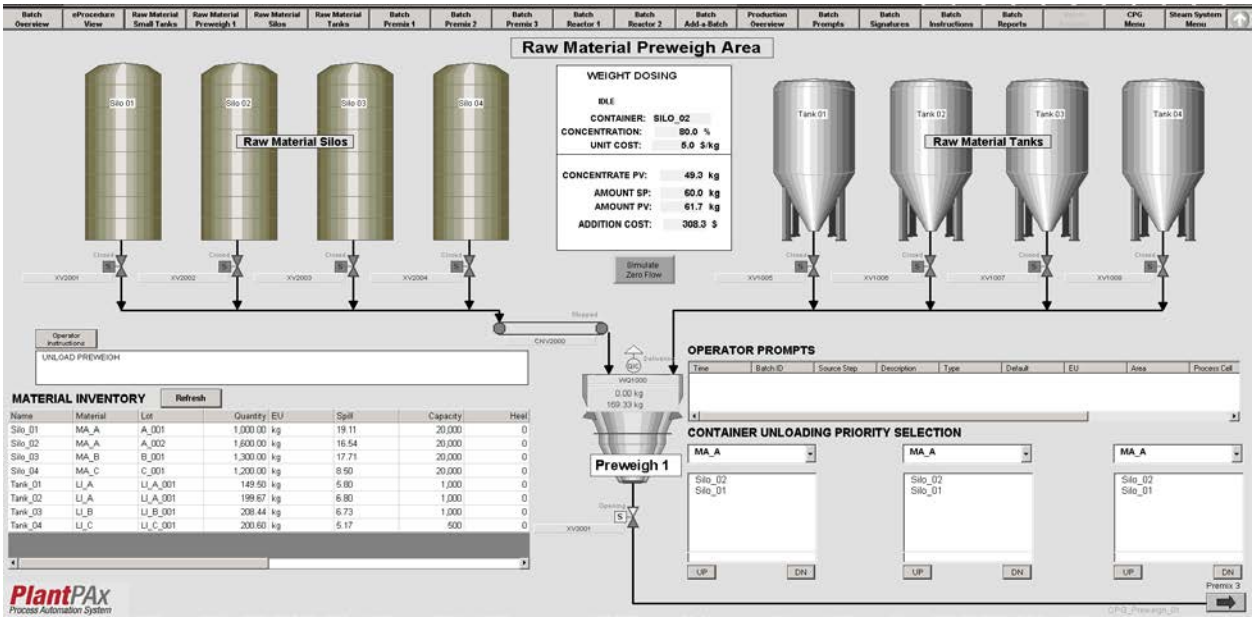
The lot of material MA_A, currently stored in Silo 02, has an 80% concentration so the calculated quantity, based on a 50 unit / unit recipe setpoint is 60.0 Kg.

Again, as with earlier additions, attribute values, setpoints, and actuals are displayed in the WEIGHT DOSING section of the Pre-Weigh 01 Unit Display.

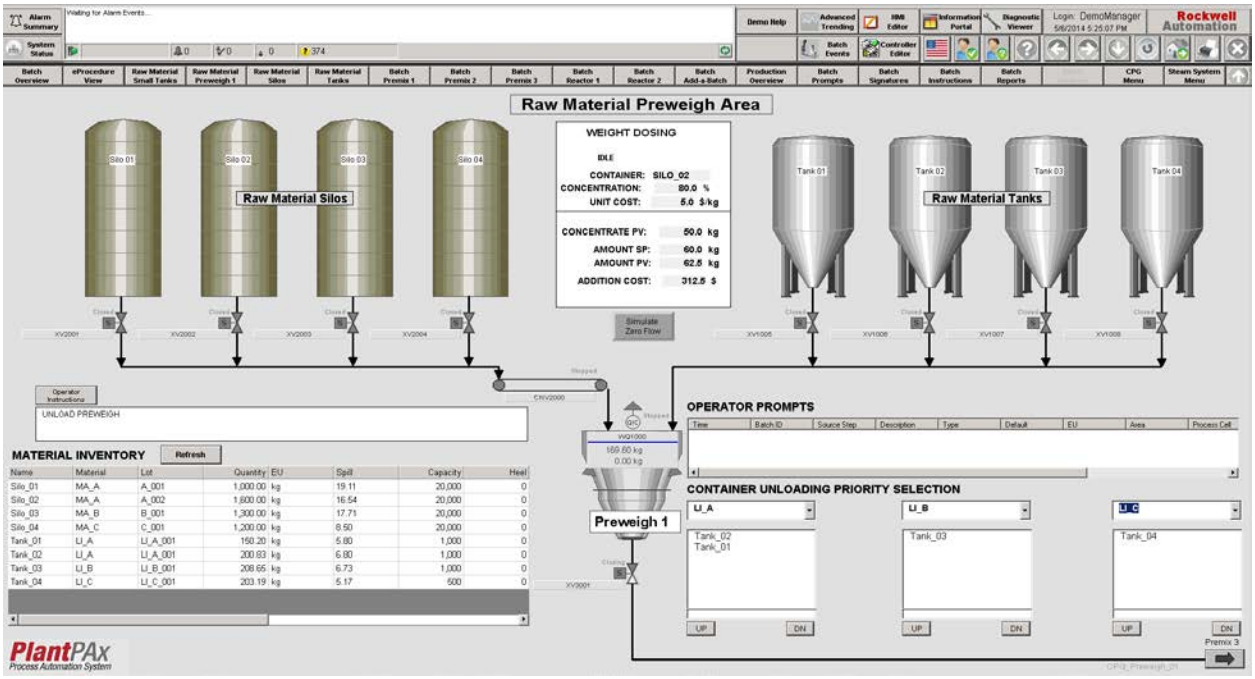


Lab 3: Factory Talk Batch
"Material Manager"

When the "pre-act" value is reached, phase logic closes the silo discharge valve and the system continues to deliver the remaining material in the transport system to the Pre-Weigh 01 Unit.

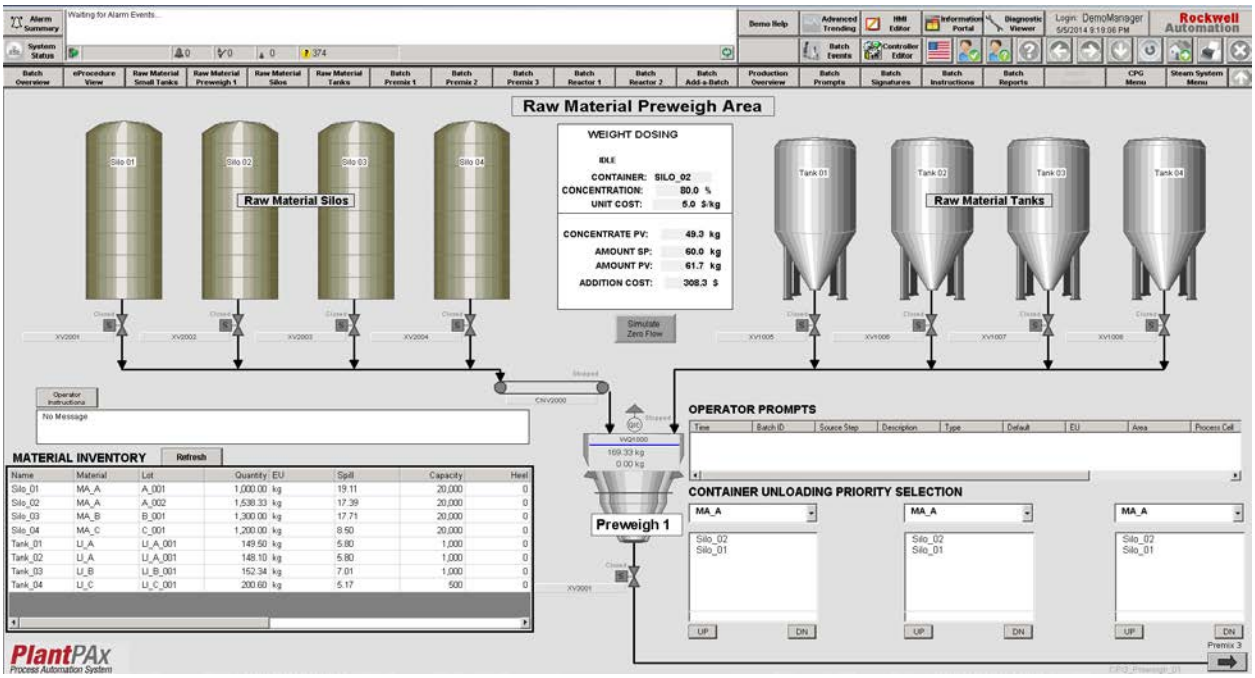


This recipe was configured to unload the hopper's contents after pre-weigh to Premix 3.



As materials are consumed by the unit, material inventory is updated, deducting the actual amount dosed to the batch.

Lab 3: Factory Talk Batch
"Material Manager"



Select **Refresh** button to see the final Material Inventory

MATERIAL INVENTORY Refresh

Name	Material	Lot	Quantity	EU	Spill	Capacity	Heel
Silo_01	MA_A	A_001	1,000.00	kg	19.11	20,000	0
Silo_02	MA_A	A_002	1,538.33	kg	17.39	20,000	0
Silo_03	MA_B	B_001	1,300.00	kg	17.71	20,000	0
Silo_04	MA_C	C_001	1,200.00	kg	8.50	20,000	0
Tank_01	LI_A	LI_A_001	149.50	kg	5.80	1,000	0
Tank_02	LI_A	LI_A_001	148.10	kg	5.80	1,000	0
Tank_03	LI_B	LI_B_001	152.34	kg	7.01	1,000	0
Tank_04	LI_C	LI_C_001	200.60	kg	5.17	500	0

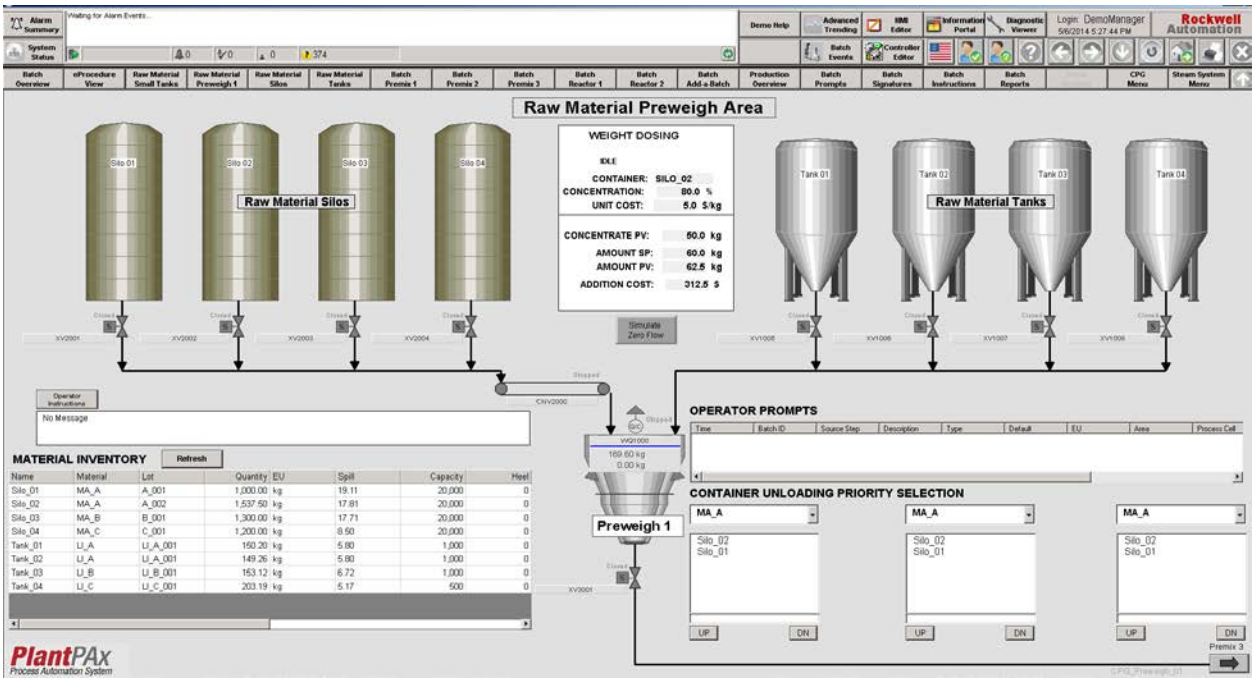
Lab 3: Factory Talk Batch
"Material Manager"

Batch #2

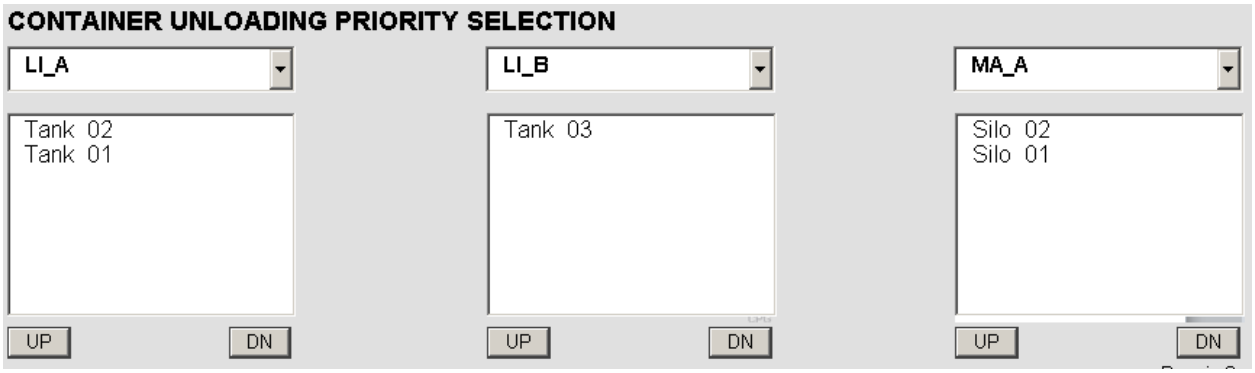
Batch #2 uses the same recipe, but this time we will demonstrate Material Manager's container rebind feature by simulating a depleted source.

This phase has been designed to prompt the operator when there is an incomplete feed. The operator makes the decision whether to (a) retry from the same source or (b) have the system (Material Manager / FT Batch) look for another source. Both options are demonstrated.

A lot is going in when running this batch, read ahead before starting the batch to understand what you will need to do.



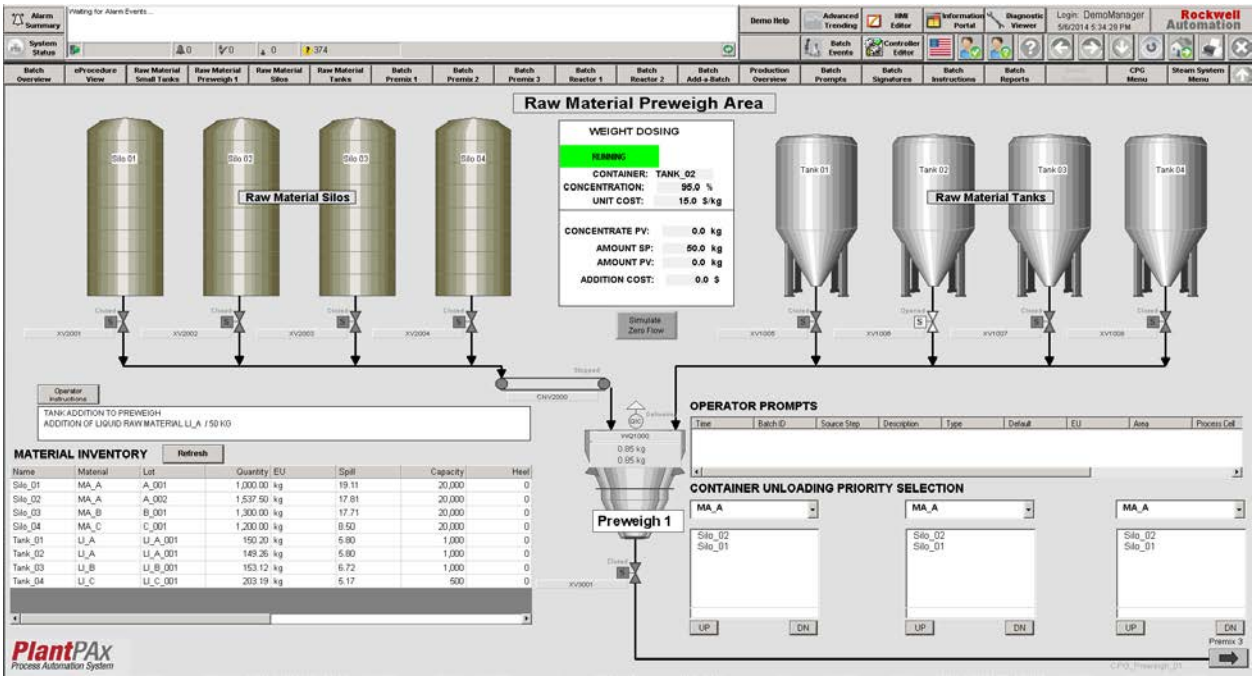
The simulated depletion will be liquid LI_A which exists in both Tank 01 and Tank 02. The priorities are set so Tank 02 is the primary source and Tank 01 is the secondary source.



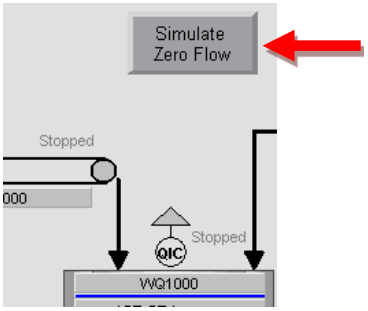
Lab 3: Factory Talk Batch
"Material Manager"

Select the **eProcedure View** button and then add and start another "PRODUCT_W_PW_OP" batch. Return to the Raw Material Preweigh 1 display.

As expected the system starts dosing liquid LI_A from Tank 02.

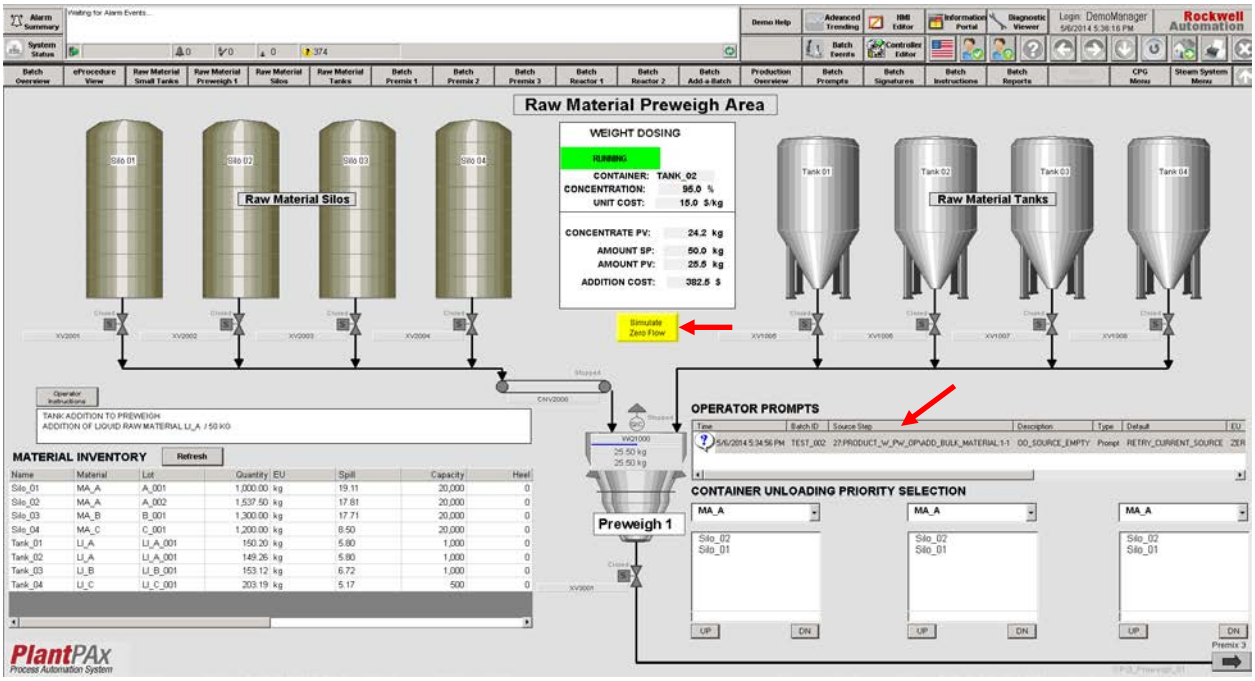


After some material has been transferred, a few kilos is enough, select "**Simulate Zero Flow**:"



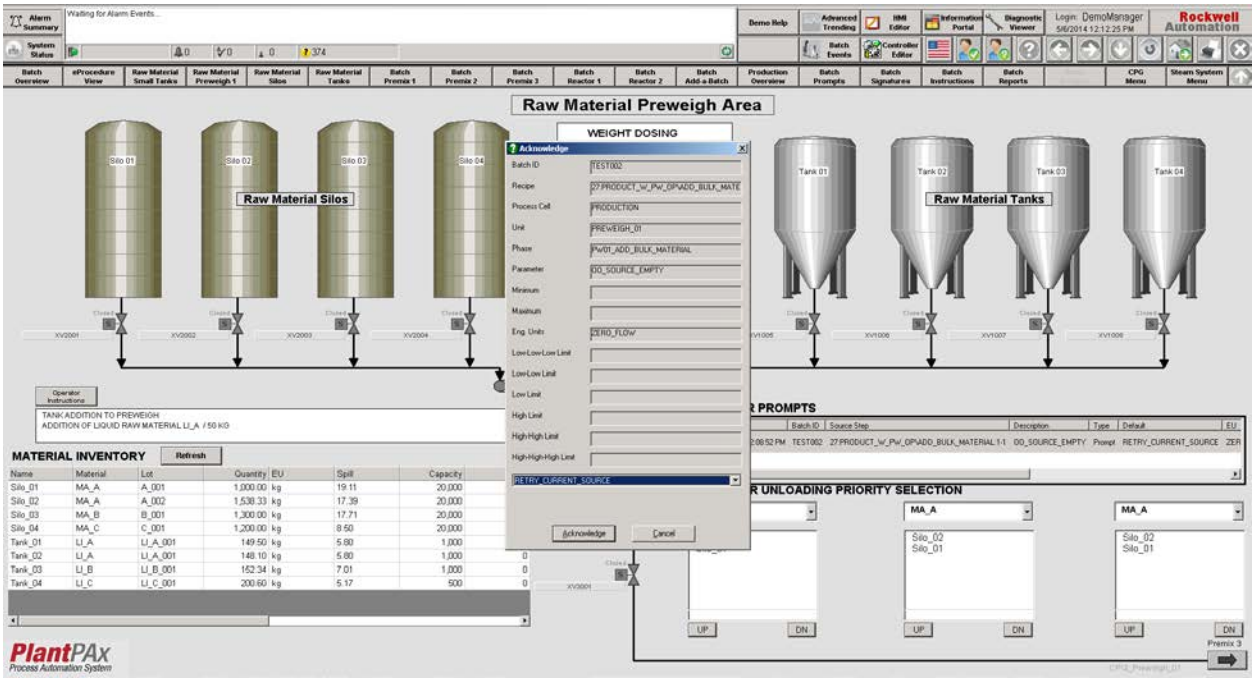
Lab 3: Factory Talk Batch
"Material Manager"

The system will stop adding from Tank 02. Select "**Simulate Zero Flow**" after the addition has stopped to reset the button and then double click on the prompt in the Operator Prompts window.



Lab 3: Factory Talk Batch
"Material Manager"

The prompt asks the operator to "Retry_Current_Source" or "Find a New Source".

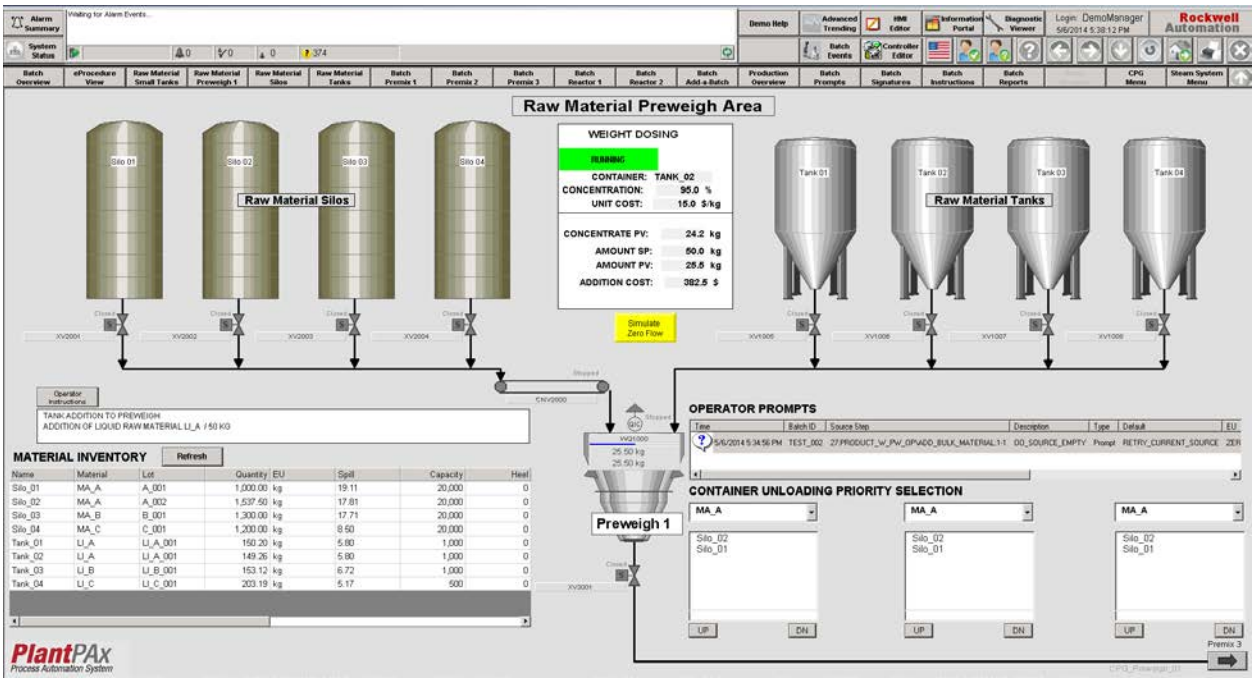


If the operator selects "Retry_Current_Source" the system resumes adding material from the initial source, Tank 02. If enough material exists to complete the required addition the remainder will come from that source.

A "retry" option is practical in many situations. Perhaps additional inventory is added to the source or often, particularly in the case of solid materials, there is sufficient inventory but a bridge or blockage is stopping flow.

Select "Retry_Current_Source" and **Acknowledge**. As soon as the addition begins select the "**Simulate Zero Flow**" button. When the addition stops select the button again to reset it.

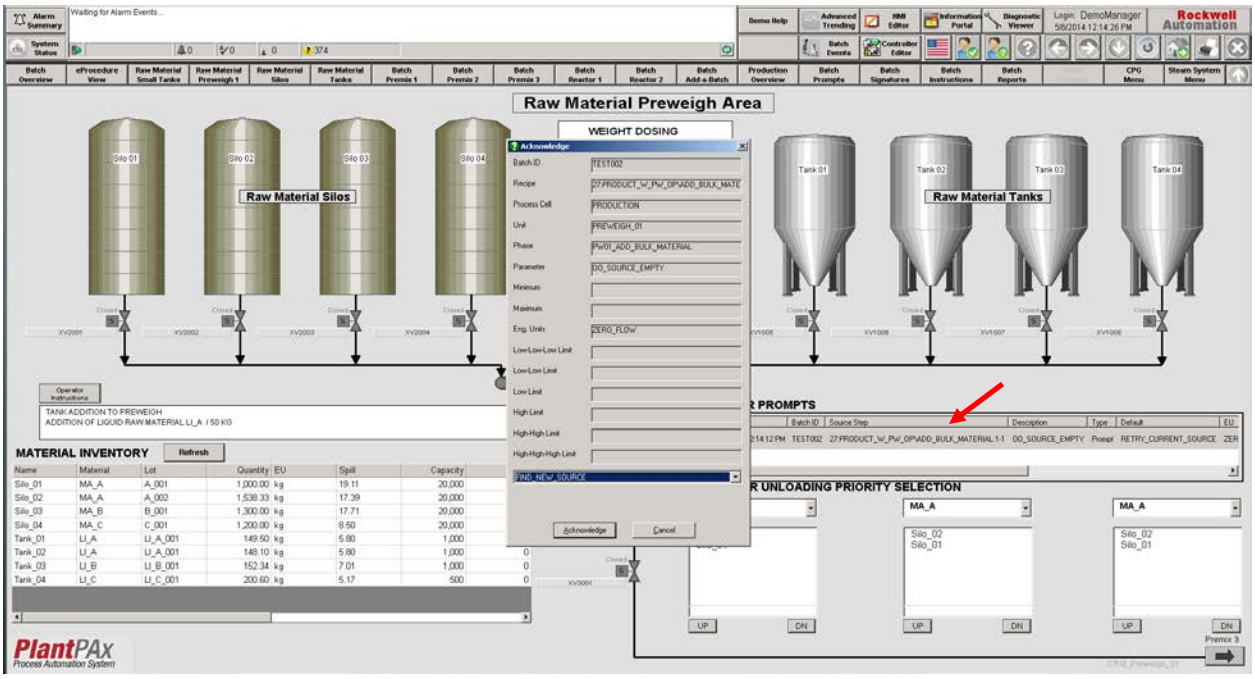
Lab 3: Factory Talk Batch
"Material Manager"



Note that the actual dosed amount. In this example, 25.5 Kg was obtained from Tank 02, before the "Simulate Zero Flow" button was pressed the second time.

Lab 3: Factory Talk Batch
"Material Manager"

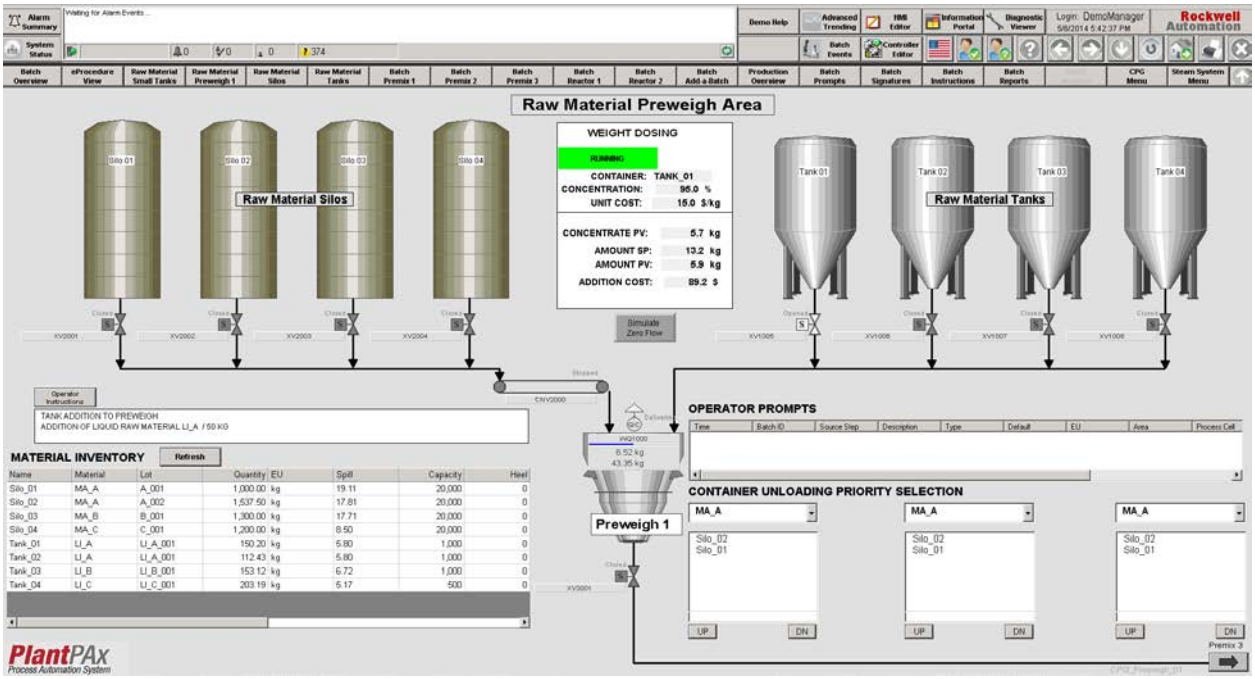
Double click on the prompt and this time select "Find a New Source" and click on **Acknowledge**.



Finding a new source caused the Batch to go to the Held state, we simulated a hold on a split feed, this was shown in one of the examples at the start of the lab. You will need to go to the **eProcedure View** clear the failures and restart the batch.

Lab 3: Factory Talk Batch
"Material Manager"

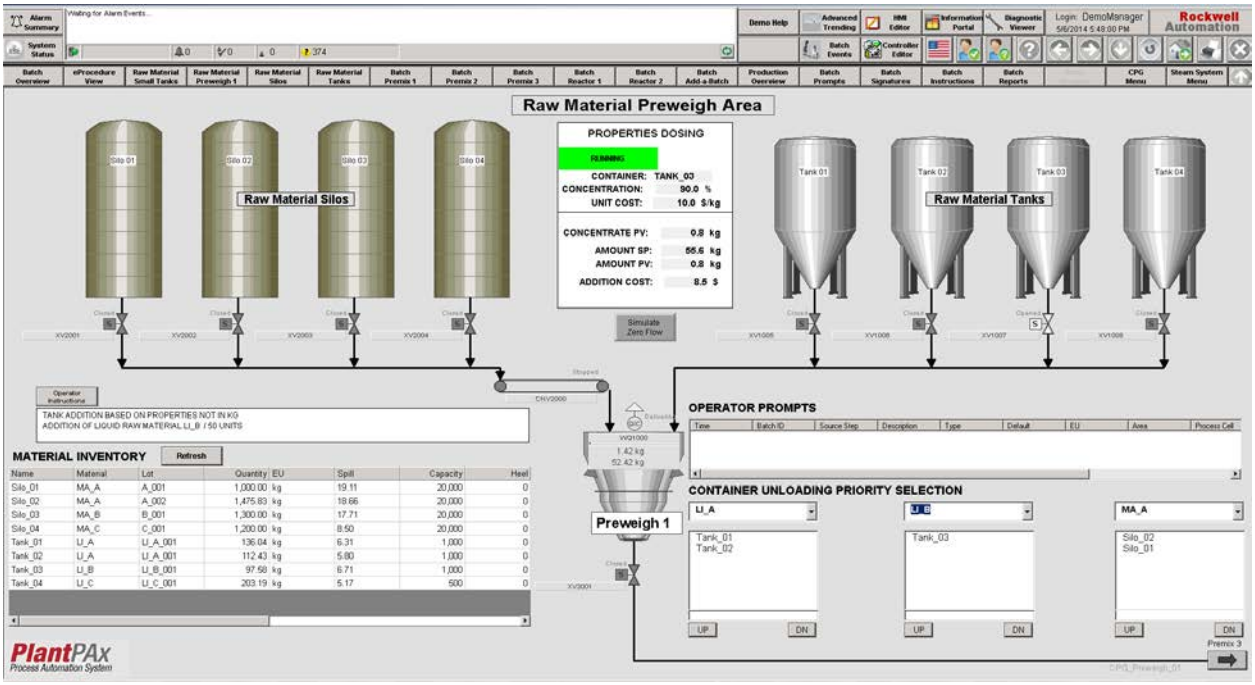
The system will evaluate the Container Unloading Priority and find the next source, in this case Tank 01. Note that the system recalculated the remaining amount required to meet the original 50 KG setpoint, which, in this example, is 13.2 Kg.

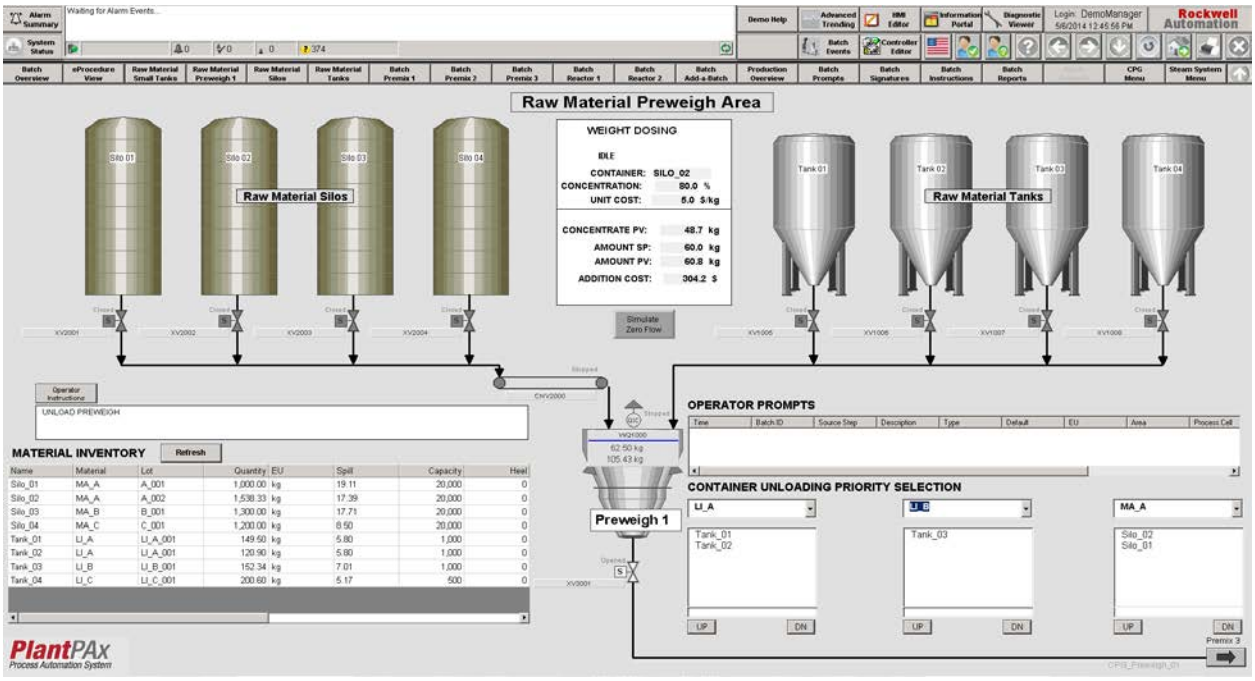


The phase adds the remaining liquid LI_A and completes.

Lab 3: Factory Talk Batch
"Material Manager"

The batch continues with the remaining material adds then finishes by unloading the Pre-Weigh unit to Premix 3.





This completes Part 2 of "Material Management with FactoryTalk Batch."

Lab 3: Factory Talk Batch
“Material Manager”

Lab4: FactoryTalk Historian SE / Batch Analysis

Lab4: FactoryTalk Historian SE / Batch Analysis Lab

Section 1 – Overview, Highlights of Lab, and Terminology

Overview:

FactoryTalk Historian SE is optimized to collect and analyze time-series data. Time-series data is continuously being sampled over time, and each sampled value can be saved in a database. In order to optimize the system and minimize storage requirements, there are different ways to run exception testing and compression on the data, so only relevant changes to the data are stored for analysis. This way the system can store much more data than if it was stored directly onto a traditional relational database.

With FactoryTalk Historian SE simply select a tag in the control system that you want the historian to monitor, and FactoryTalk Historian does the rest. The result is a series of data values which are collected over time in an optimal way to minimize storage space in the historian. With the FactoryTalk Batch Interface simply install the product, configure the INI, and FactoryTalk Batch control recipe (batch) records will be archived by FactoryTalk Historian SE to the Module database.

A Batch Event Interface will efficiently take data from your FactoryTalk Batch event journals files for data storage within the historian database. This batch data can be used by other FactoryTalk Historian SE applications providing a comprehensive set of analysis and visualization tools. Process Book combined with Batch View and Active View help make delivery of the tools flexible and targeted to the right users. With the BatchView add-in to Process Book, the batch data can be configured to allow the operators or engineers to analyze batch data and easily compare time-series data against the batch execution data. This information can provide knowledge to help operations make improvement in overall yield and quality of their batches. The ability to compare cycle times, tag a Golden Batch, compare different batches, compare unit execution, and better understand patterns and repeatable events. This valuable information may lead to identifying and removing process bottlenecks, optimize your batch times, increase overall production, increase equipment utilization, minimize reprocessing and discarded batches!

Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

> **NOTE:** This lab assumes that you are familiar with the FactoryTalk Batch application as well as the PlantPAx process control system to perform various operations like creating, commanding and removing batches without help. If you are not familiar with this, please take the basic batch lab before taking this lab. This lab does not require a strong working knowledge of FactoryTalk Historian SE.

We apologize in advance to any FactoryTalk Historian SE power users; this lab assumes the user has no strong working knowledge of the FactoryTalk Historian SE product. Here are the main highlights of each remaining section for this lab:

Section 2: (Engineer constructs FactoryTalk Historian SE Points)

You will select a few control system tags from the Logix controller for the two reactor unit's levels as data points within the FactoryTalk Historian. You will verify that these data points exist as well as understand that other relevant control system tags for your units that have been previously configured as data points to the historian. In addition, you will explore the Excel SMT Add-In, also called the Tag Configuration tool that allows you to work with Historian tags in Microsoft Excel.

Section 3: (Engineer's take on the FactoryTalk Batch Interface)

Here you will explore the new FactoryTalk Batch Interface. This interface dynamically builds your equipment model in the Historian database, and it efficiently allows you to capture detailed batch event information from your batch records.

Section 4: (Engineer's perspective of ProcessBook with BatchView)

Here you will use Batch View in a thick-client application for ProcessBook. Within ProcessBook, BatchView will make it easy to make batch-to-batch comparisons for completed or active batches. Comparisons against a golden or anchored batch become very simple. Relative time comparisons can be made between batches as if they all started at the same time. Time series data can be simply configured for trending against the batch data. The BatchView in ProcessBook can simply and efficiently enable engineers to analyze their data, as well as expose this tool for the operators within the View SE environment.

Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

Terminology:

Control system tag, or **memory tag** refers to a name assigned to a memory register in the control system that holds some sort of process data. For example, this could be a memory register in a controller, or a data value in the HMI server.

A **data point** is a Factory Talk Historian SE term which refers to a location in the control system from which FactoryTalk Historian SE collects data. A data point can be a control system tag or memory tag (i.e..any FactoryTalk Data Live tag).

A **reporting tag** is a Historian term for the time-series data stored in the FactoryTalk Historian database that was sampled from a single point such as a control system tag.

Auto Discovery: allows the system to automatically discover controllers and other data sources without the need for the user to identify the controller name and/or address. The system will start in the data tree within FactoryTalk Application from where the user identifies the starting point of the search, and discover all data sources from that point and all tags in those sources.

Auto Configure: allows the system to automatically configure known tags and points based on templates that define what points to search. This means that the system will very quickly find only the relevant points to configure, and allow the user to configure these in one step.

FTLD1 Interface: is a component of the FactoryTalk Historian and is responsible for the FactoryTalk LiveData data collection from Data Servers in the FactoryTalk Directory. This interface will apply exception and compression as necessary on a tag by tag basis. The tag data that is collected can be stored in a local buffer if the FactoryTalk Historian is not available.

Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"
Section 2 – Engineer constructs FactoryTalk Historian SE points

There are many ways to define data points of interest within FactoryTalk Historian SE. In this lab will demonstrate one option which is to Add Individual Historian Points by the engineer, or configurator. In addition, we will demonstrate a mass configuration change within Excel to export the information back to the FactoryTalk Historian server using the PI SMT (System Management Tool) Add-In. This lab does not demonstrate Rockwell exclusive feature that includes Auto Discovery (Discover Historian Points), or Auto Configure. To work more with this and other features of FactoryTalk Historian, please consider attending a FactoryTalk Historian SE specific lab sometime later this week.

In this lab, we will briefly expose the user to how they might use MS Excel to import tags from the Historian to harness the power available through Microsoft Excel and the SMT Add-In for viewing, documenting, modify, creating and deleting(if option enabled) Historian tags.

Initially, you will run the Add Individual Historian Points to allow you to identify or create just a few data points of interest. You will see how to add data points to the historian server database with a default configuration. The control system tags that we choose will become captured data points by the historian server. This will allow you to view the time-series data with batch execution data in later sections of this lab.

Let's get started identifying our points with Historian so we have our time series data …

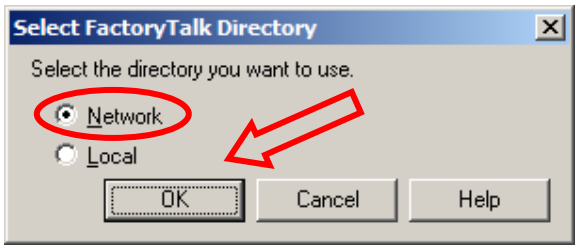
1. This lab assumes that you are familiar with the basic batch functions of the FactoryTalk Batch application as well as the PlantPAx process control system. If this is not true, you should take the basic batch lab before trying to go further in this lab.

2. Please verify that you are in the ***AppSerHist*** VMWare image. This is the VMWare image where the FactoryTalk Historian SE product has been installed. There are 2 other images with this lab that we will abbreviate PASS01 and AppSerBatch.

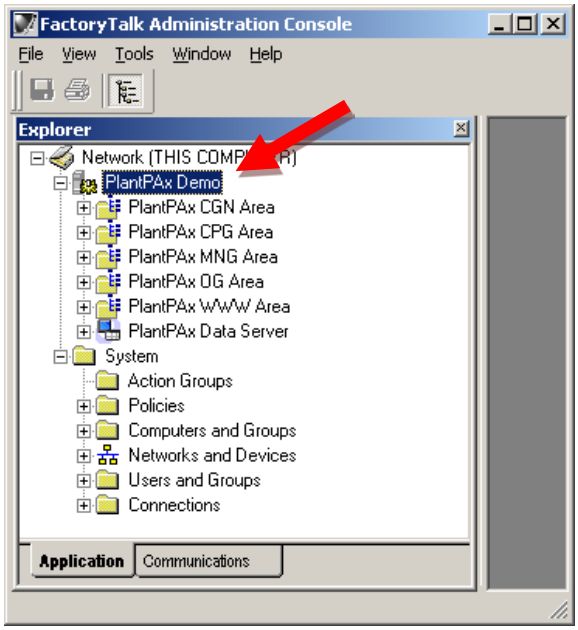
3. To add our new historian data points, please open the **FactoryTalk Administrator Console** tool by selecting it from the **Start Menu** shortcut list.

“Historian SE / Batch Analysis”

4. On the **Select FactoryTalk Directory** dialog, select **Network Directory** and press the ***OK*** button.



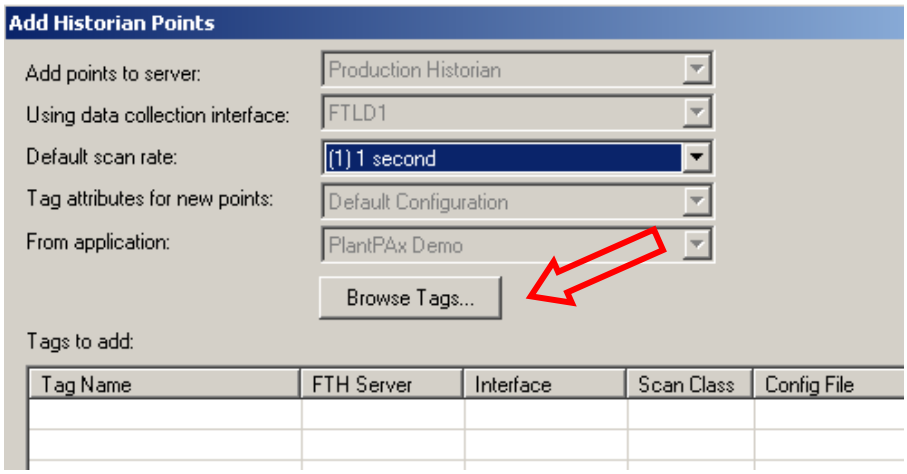
5. Expand Network, and select **PlantPAx Demo**. Right mouse click and select **Add Individual Historian Points**.



Right mouse click and select **Add Individual Historian Points**.

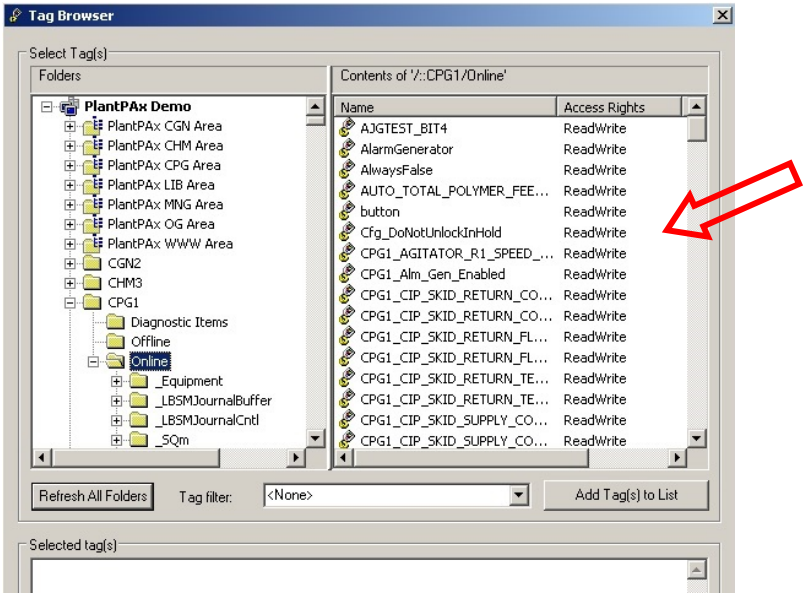
"Historian SE / Batch Analysis"

6. Keep the default scan rate at 1 second from application PlantPAx Demo. Press the ***Browse Tags*** button to add tags.



This will take a moment to collect a list of tags and display the tag browser.

7. Within the Tag Browser window, expand the ***PlantPAx Demo*****,** open ***CPG1*** area, double-click on the **Online** folder to open. We are using the FactoryTalk Live Data connection to the controller where the CPG1 desired device inputs happen to exist.

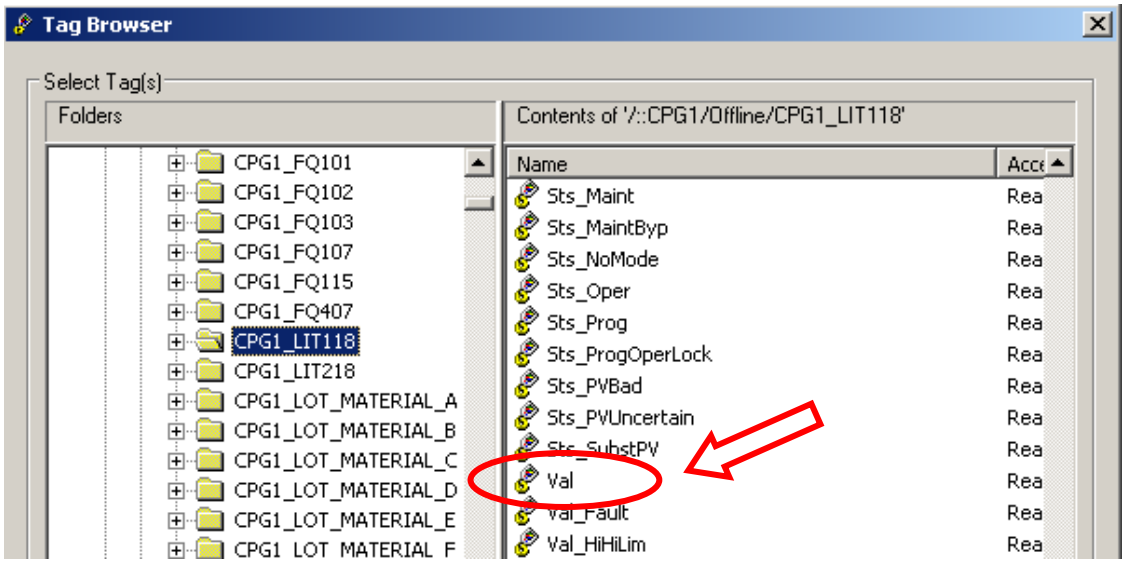


.

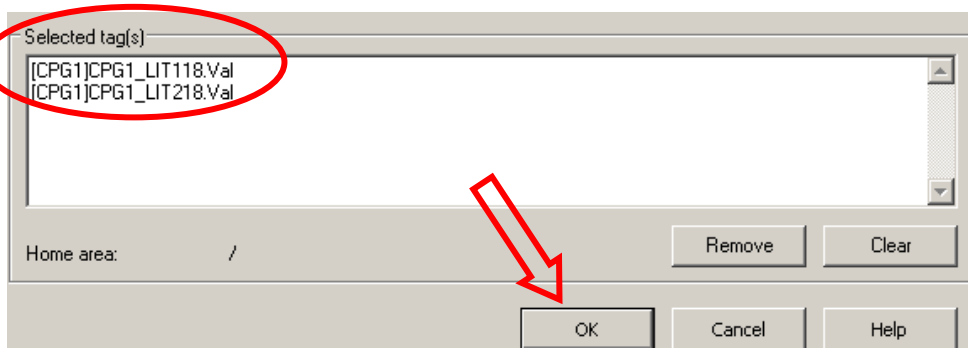
8. You can scroll down the ***Folders*** list to find the desired control system tags which are level inputs for

"Historian SE / Batch Analysis"

Reactor 1 and Reactor 2 named, ***CPG1_LIT118.Val*** and ***CPG1_LIT218.Val***, respectively. You can find the Val parameter in the ***Contents*** list to the right.

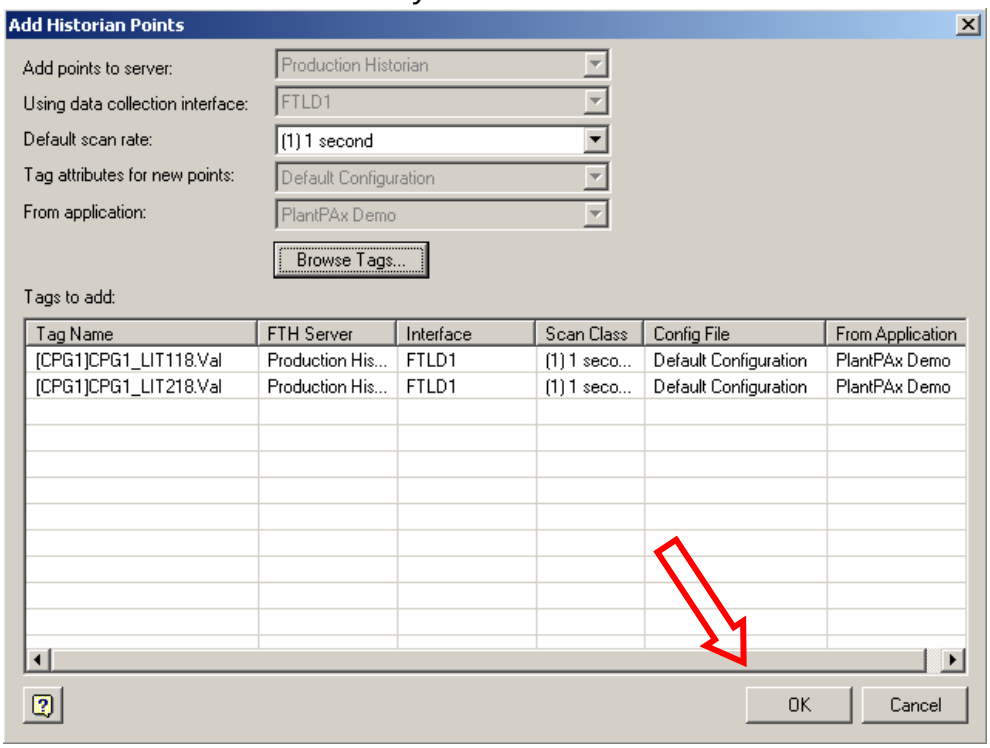


9. Add the two control system tags for reactor level to the browser's selected tag list by **double-clicking** on the ***Val*** parameter of the tag, then press **OK** to close the window.



10. Notice that you can only change the Default scan rate, everything else is predefined. Select ***OK***.

"Historian SE / Batch Analysis"



This is one way that you can add Factory Talk SE Historian points for capture within the Module database.

We have previously added some additional process input tags for the reactor which you will use later for analysis in conjunction with your batch execution data. These tags are:

CPG1_TIC116.VAL_PV – Reactor 1 Temperature Process Value

CPG1_TIC116.VAL_SP – Reactor 1 Temperature Set Point Value

CPG1_TIC116.VAL_CVOUT – Reactor 1 Temperature Control Value

CPG1_PIC118.PV – Reactor 1 Pressure Process Value

CPG1_PIC118.SP – Reactor 1 Pressure Set Point Value

CPG1_PIC118.CV – Reactor 1 Pressure Control Value

CPG1_TIC216.PV – Reactor 2 Temperature Process Value

CPG1_TIC216.SP – Reactor 2 Temperature Set Point Value

CPG1_TIC216.CV – Reactor 2 Temperature Control Value

CPG1_PIC218.PV – Reactor 2 Pressure Process Value

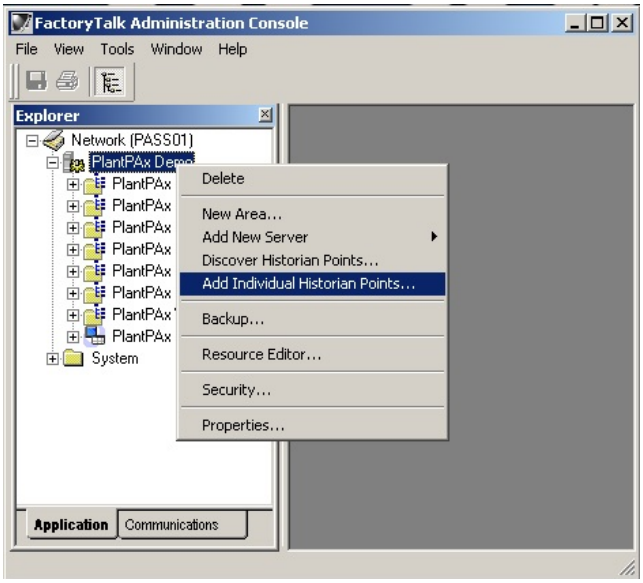
CPG1_PIC218.SP – Reactor 2 Pressure Set Point Value

CPG1_PIC218.CV – Reactor 2 Pressure Control Value (output value of the PID controller)

These tags will be used in Aliases for real-time trending with Unit Batch data later.

"Historian SE / Batch Analysis"

> **NOTE:** This previous method for adding tags may not be a very good choice when many tags are required to be established. A distinction of the FactoryTalk Historian SE product is a simpler way for users to add a large group of tags into the Module database using the Discover Historian Points feature within the FactoryTalk Administrator Console. To understand more details about how to use the auto discovery of tags, there is a YouTube video to watch called, **Tag Auto Discovery in FactoryTalk Historian SE** at:
> **http://www.youtube.com/watch?v=m99c103qYMg**



11. Please close the FactoryTalk Administration Console: ***File -> Exit***

12. Let's verify that these data points are recorded values within the FTHistorian. To do this we need to run some batches to get dynamic level data archived into the Historian Module database. If data is not changing, it certainly won't be interesting and without the changes, the event to trigger the collection and compression of data won't occur within Historian.

> **NOTE:** To understand more about the Historian algorithm for data archive and compression, there is a YouTube video to watch called, **Data Compression and Exception in FactoryTalk Historian SE** at:
> **http://www.youtube.com/watch?v=fdH7dYTN7gM**

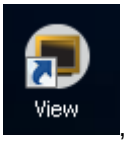
Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

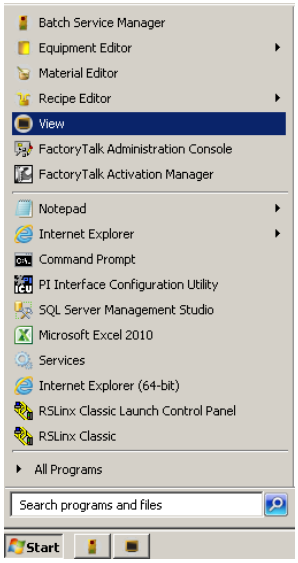
13. We can use the FactoryTalk Batch View application to create and run batches that will cause process data to change and be recorded within the Historian. This FactoryTalk Batch View is a much different application than the PI Historian Batch View product that we will explore later in this lab to analyze batch data.

    Please switch to the VMWare ***AppSerBatch*** or ***PASS01*** image, whichever you are more comfortable using. The FactoryTalk Batch View application is installed on both, the PASS01, and AppSerBatch VMware images. To create and run batches, you must use a batch interface of some kind, even the SE client would work. To keep it simple we will just use the Batch View application.

> **NOTE:** Everything needs to be running properly in the controller and the FactoryTalk batch server services. The initial check section of this lab has you verify that all your hardware and software is in an acceptable state. If you did not verify ***Initial Checks*** in the beginning section **"About this Lab**," then please do so now.

14. Start the FactoryTalk Batch View application. There is a desktop icon that you can launch, 

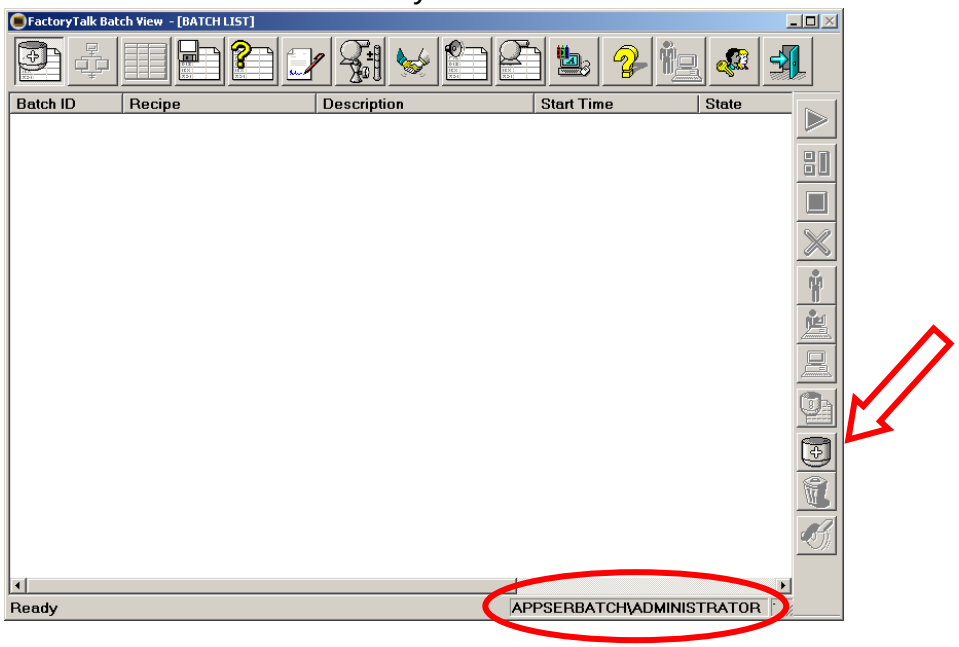
, or you can choose the ***Start menu***, select ***View*** as seen below:



15. From the FactoryTalk Batch View, you should be logged on as APPSERBATCH\ADMINISTRATOR. This will reflect how you are logged on to FactoryTalk Security for this FactoryTalk Batch View application. Please create a batch by selecting the

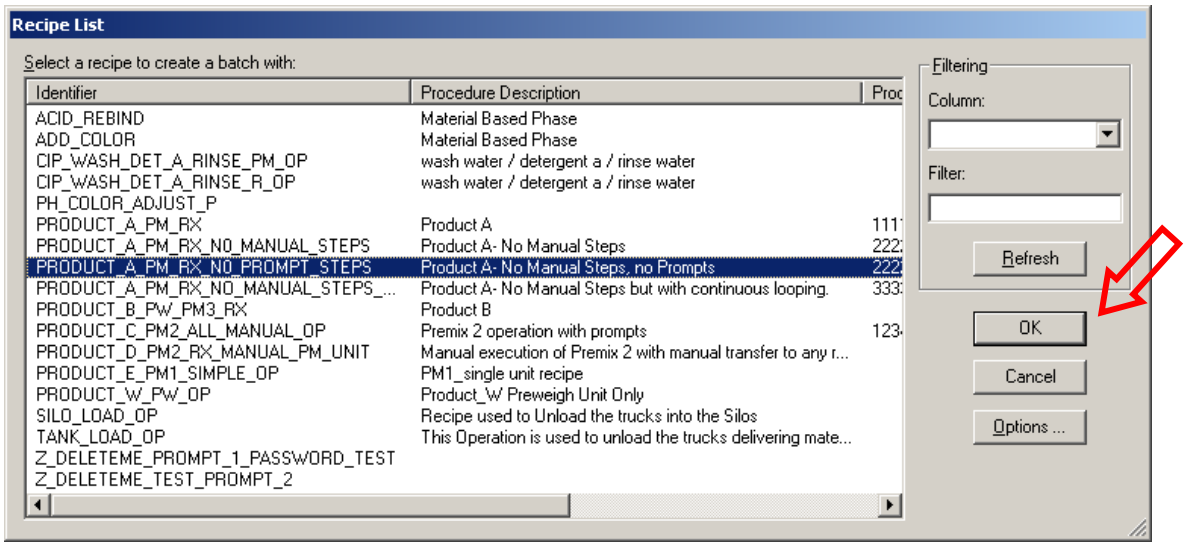
icon button on the right.

"Historian SE / Batch Analysis"



16. Answer ***Yes***, you would like to create a batch. This Yes/No popup is a configurable prompt to the command.

17. Select the ***Product_A_PM_RX_NO_PROMPT_STEPS*** master recipe to instantiate a new control recipe to make a batch of Product A material.

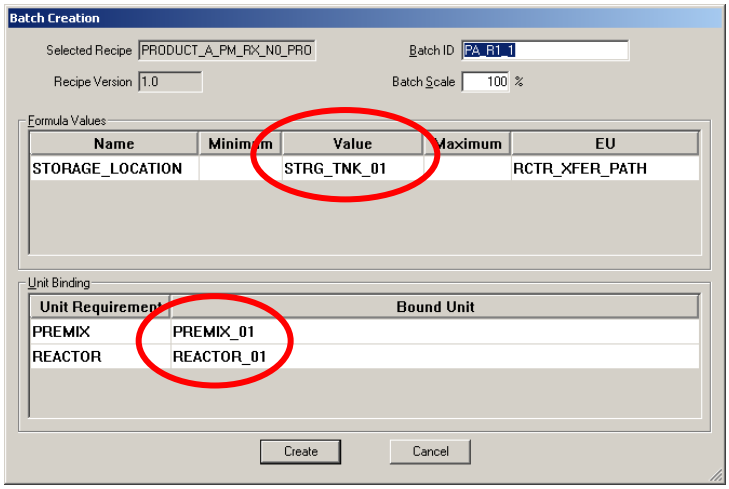


Select ***OK***

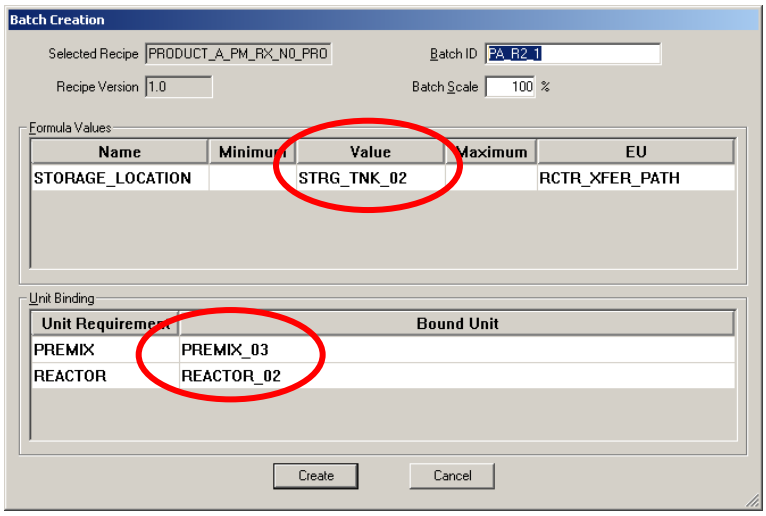
"Historian SE / Batch Analysis"

18. In the Batch Creation pop-up window, please enter a unique Batch ID. May I suggest something simple like, PA_ followed by R1 or R2 for the reactor it will run in, ending with _001 for the first batch, _002 for the second batch, and so on. For a formula value you may choose **STRG_TNK_01** for reactor 1 and **STRG_TNK_02** for reactor 2, then select the ***Create*** button.

    For reactor 1, the bound units will be Premix_01 and Reactor_01, use the Batch ID: ***PA_R1_001***

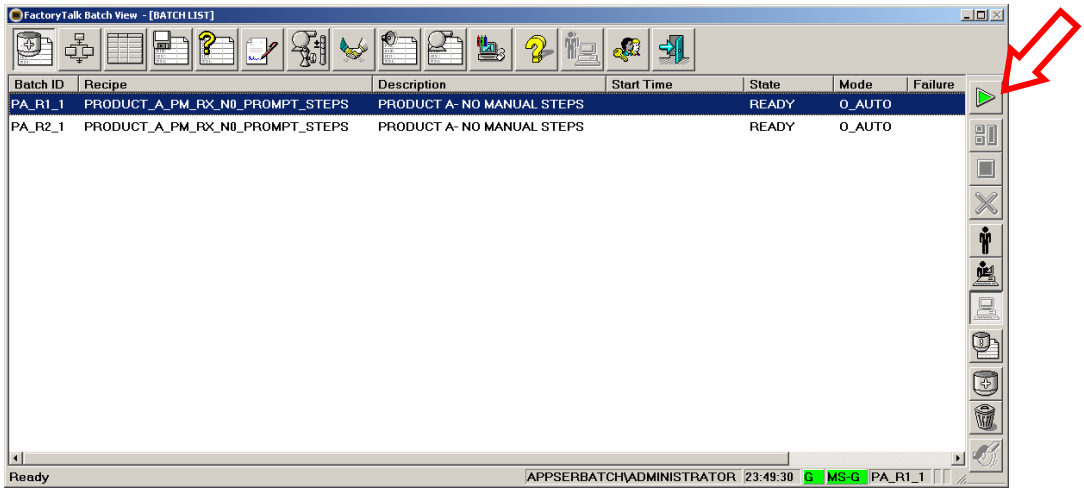


    Repeat this step for reactor 2, the bound units will be Premix_03 and Reactor_02, use the Batch ID: ***PA_R2_001***



"Historian SE / Batch Analysis"

19. Select the ***Start*** button to command each of the batches to run.



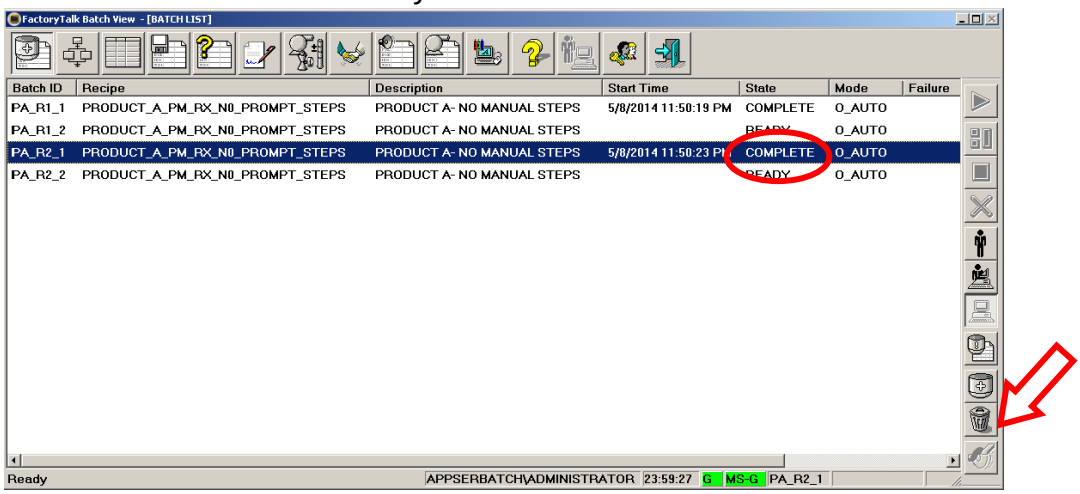
While waiting for the first set of recipes to Complete, you can create the next set of control recipes, or batches - PA_R1_002 and PA_R2_002. Do not start the second set of recipes until instructed later.

These first 2 running recipes should finish in about 10 minutes, but reactor 2 recipe may take a minute longer than reactor 1. Call the lab assistant if it is taking much longer, and you are not sure it is progressing properly.

Do not start the second set of recipes until instructed later.

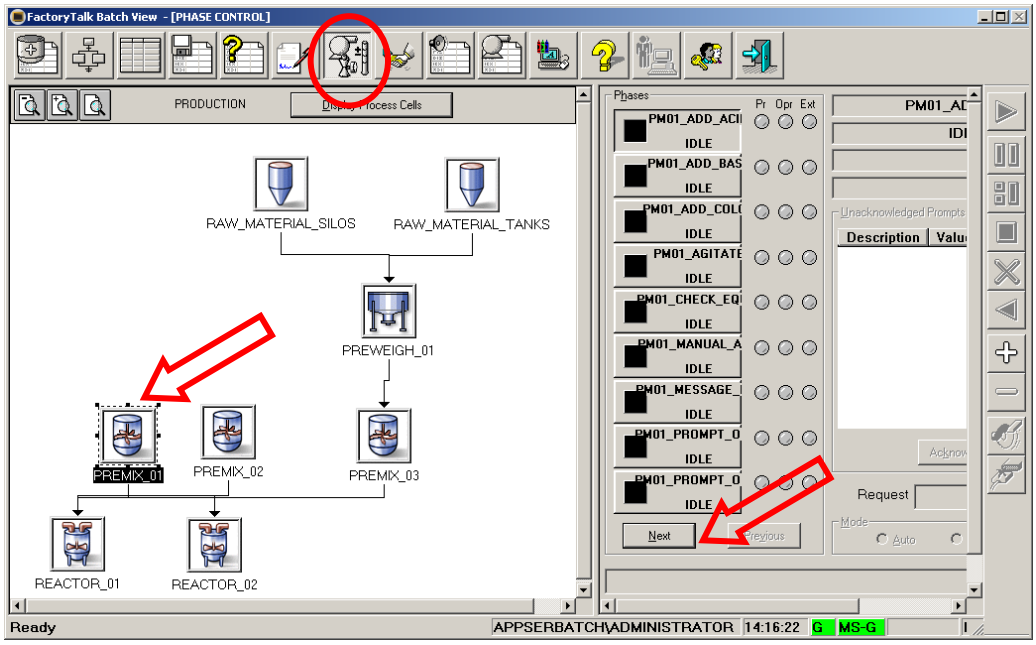
20. Remove the COMPLETE recipes. To remove a recipe once **Complete**, select the recipe on the list and choose the ***Remove*** command icon on the right,

“Historian SE / Batch Analysis”

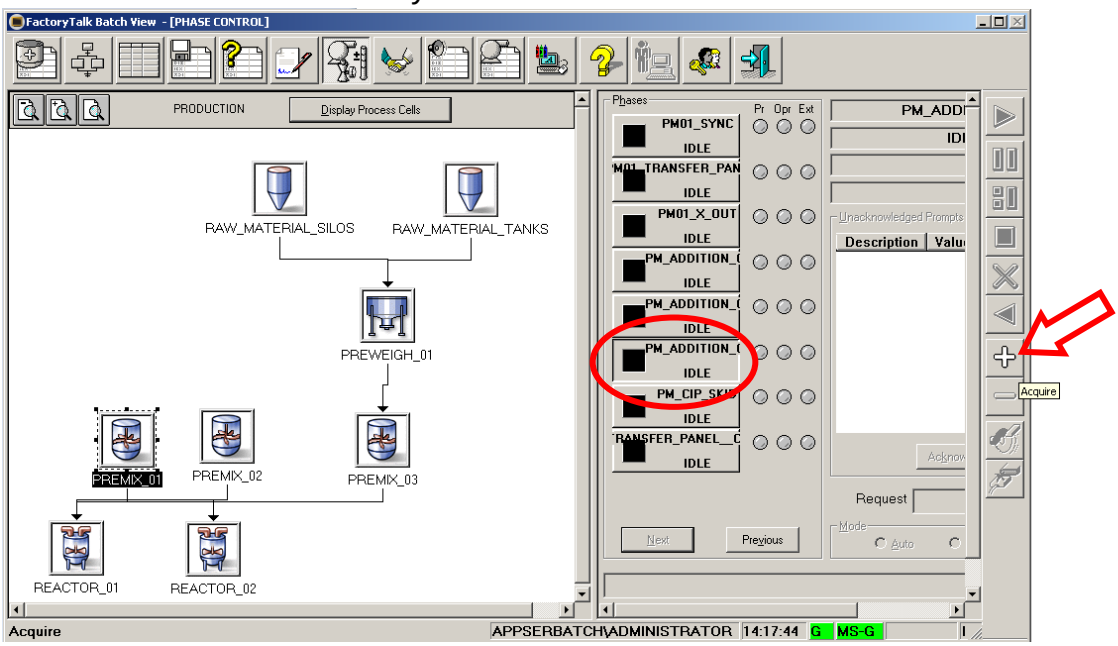


.

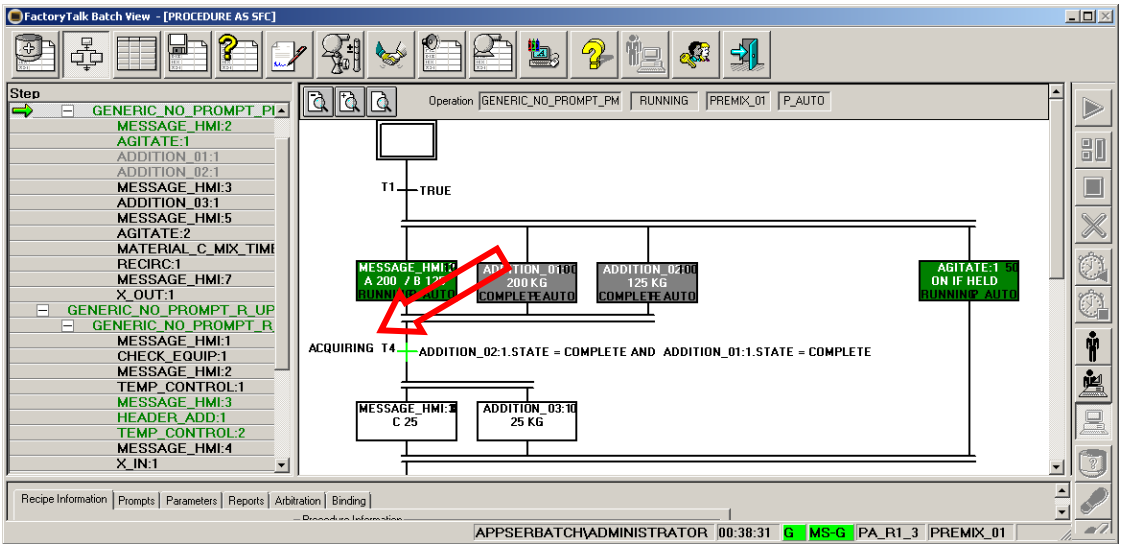
21. For the remaining control recipe that will run in Premix 1, let us setup an operational delay before starting this recipe in premix 01 and reactor 1. Go to the ***Phase Execution*** screen, and select ***PREMIX_01*** in the equipment list, and select the ***Next*** button twice for the Phases to get to the ***PM_ADDITION_03*** phase to select it and acquire ownership (+ icon button) as an operator.



“Historian SE / Batch Analysis”

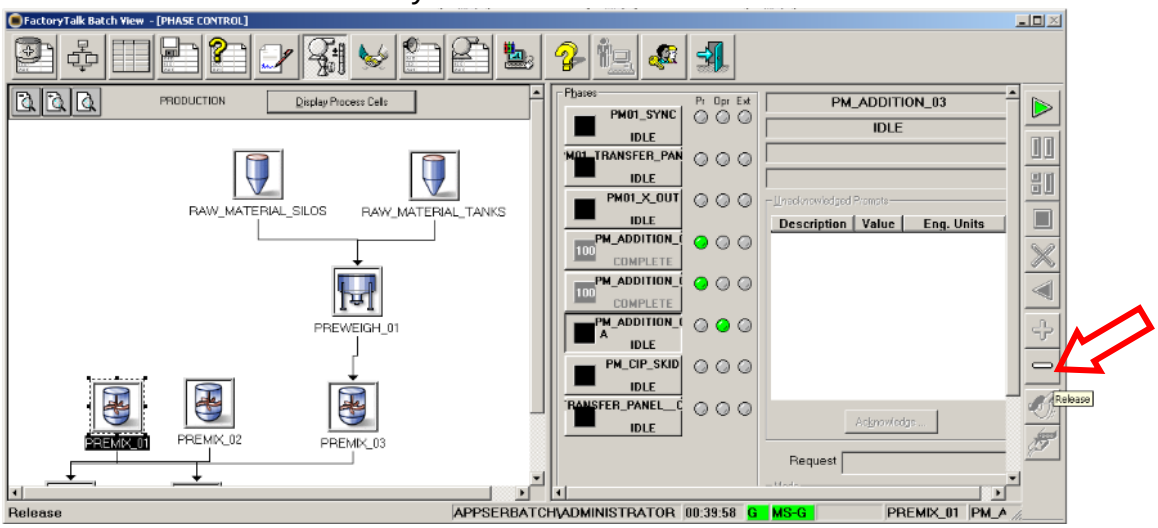


22. Start just this one recipe in the Procedure View (SFC), and wait for the acquiring transition state,

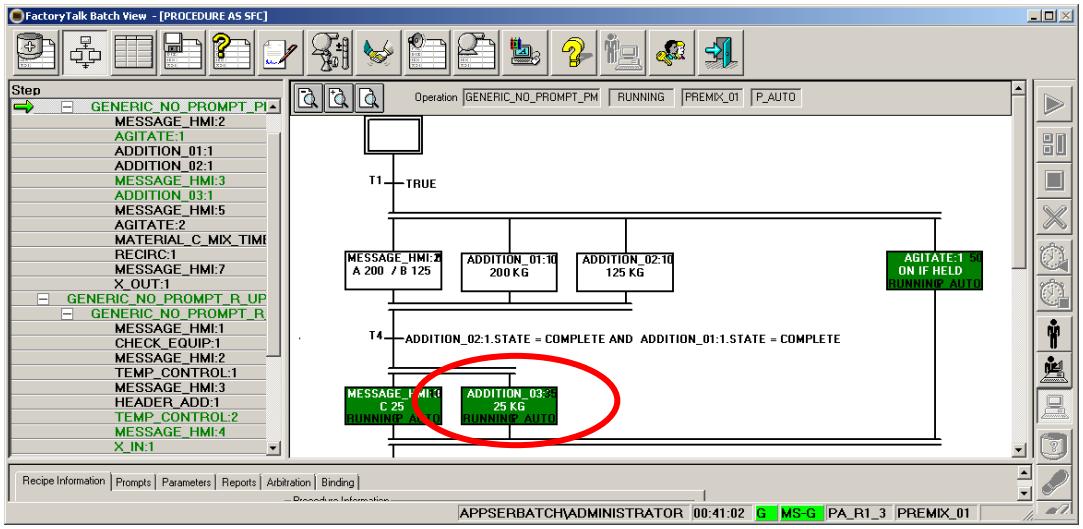


23. Wait a minute, then ***Release*** the ownership of the phase ***PM_ADDITION_03***

“Historian SE / Batch Analysis”

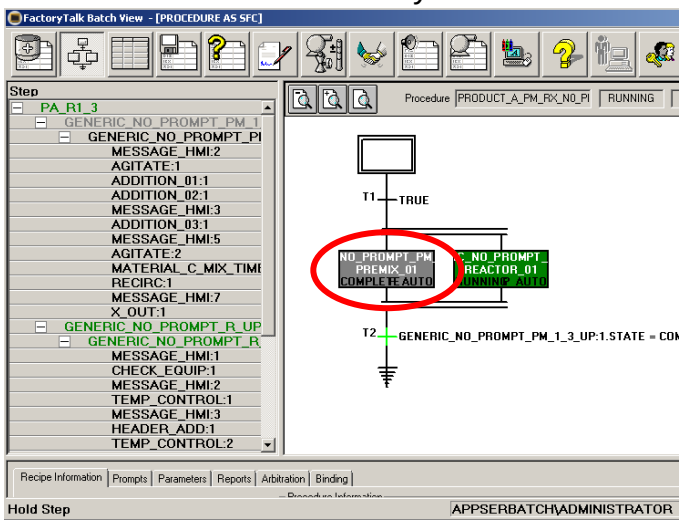


24. Verify that the control recipe takes ownership of the phase and continues running,

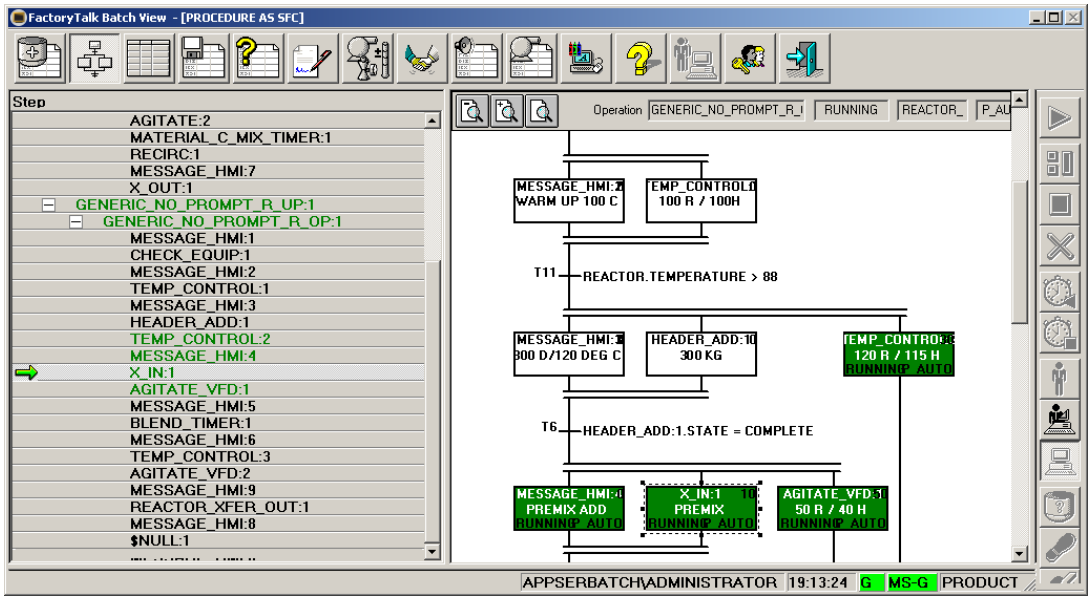


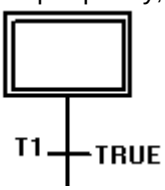
25. With the recipe running, let’s wait until the unit procedure running in PREMIX_01 is Complete,

"Historian SE / Batch Analysis"



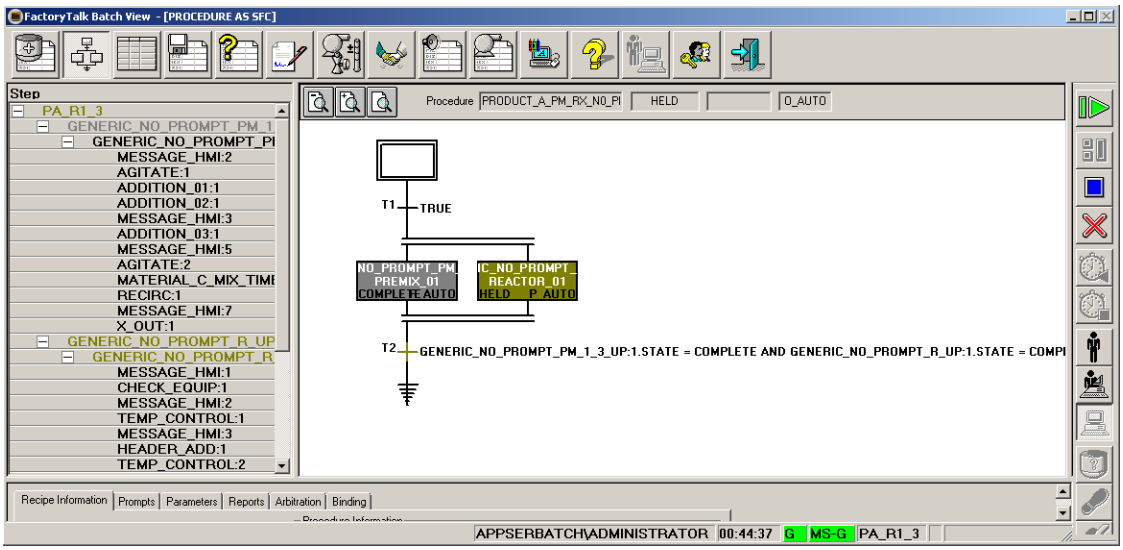
Drill into the running Reactor 1 unit procedure to see the phases that area actively running:



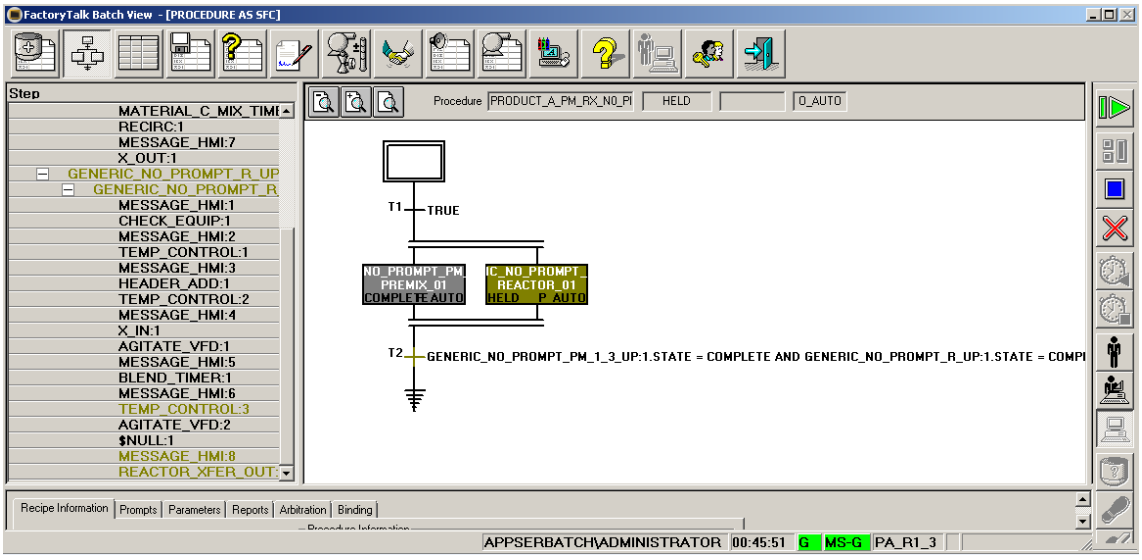
26. This time you shall cause an operational problem within the reactor unit, Go back to the procedure level, or top of the recipe quickly, either by scrolling up the step hierarchy on the left, or double-click in the initial steps 

at each level until it brings you to the top of the procedure, and touch the white space area so the command buttons have focus. With the procedure level selected,

press the ***Hold command,*** so the recipe goes to Held:



Wait a minute, then Restart the recipe. Repeat this same process again (i.e. ***Hold, Wait, and Restart***) when the recipe control gets to the very last phases with the transfer out running, ***REACTOR_XFER_OUT*** :



27. Let the control recipe go ***COMPLETE,*** then ***Remove*** this completed recipe from the batch list.

    NOTE: The other control recipe that will run in reactor 2 has not been started. We will start this recipe later.

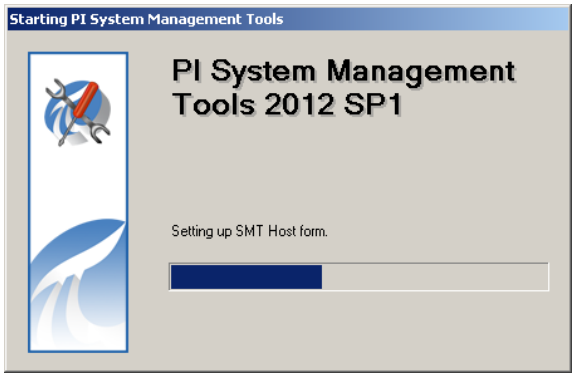
Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

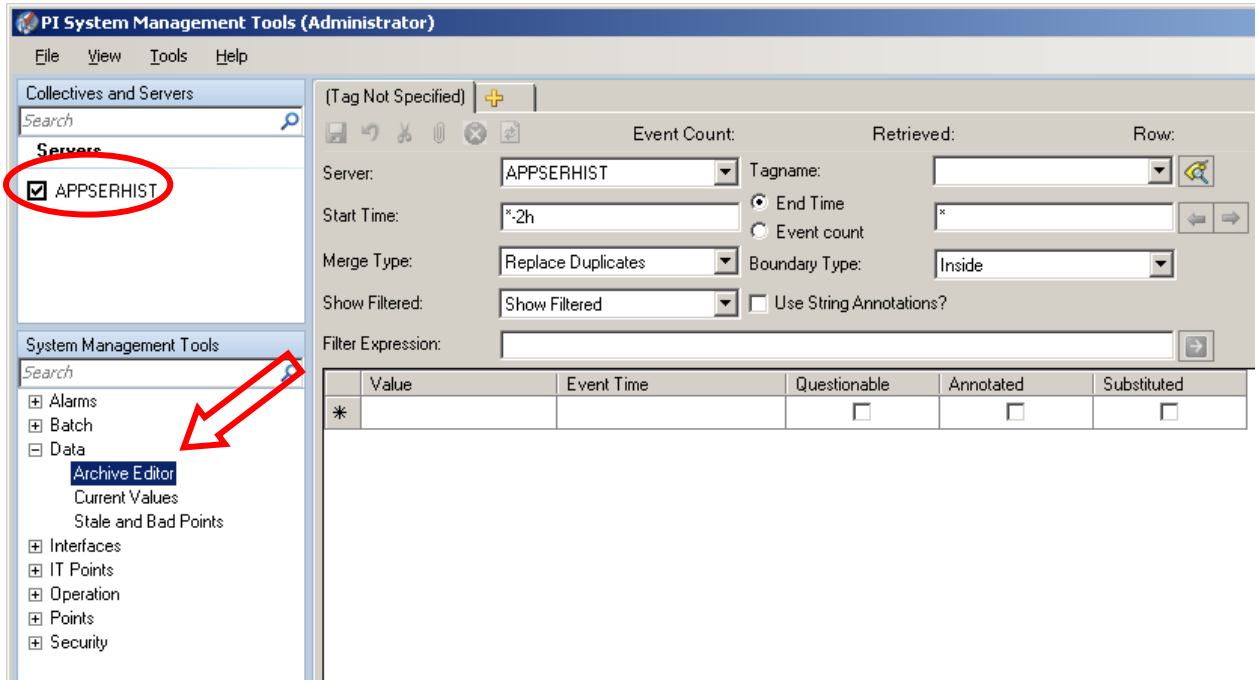
28. Switch back to the ***AppSerHist*** VMWare image to continue on with this Historian lab.

29. On the ***AppSerHist*** image please click to open the ***System Management Tool***, or PI SMT 2012 SP1 as it is pinned to both, the Start Menu, and Task Bar.

, and wait for it to load.



30. Once open, the default server is ***AppSerHist***. Under System Management Tools, please select to open ***Data***, and then choose ***Archiver Editor***.

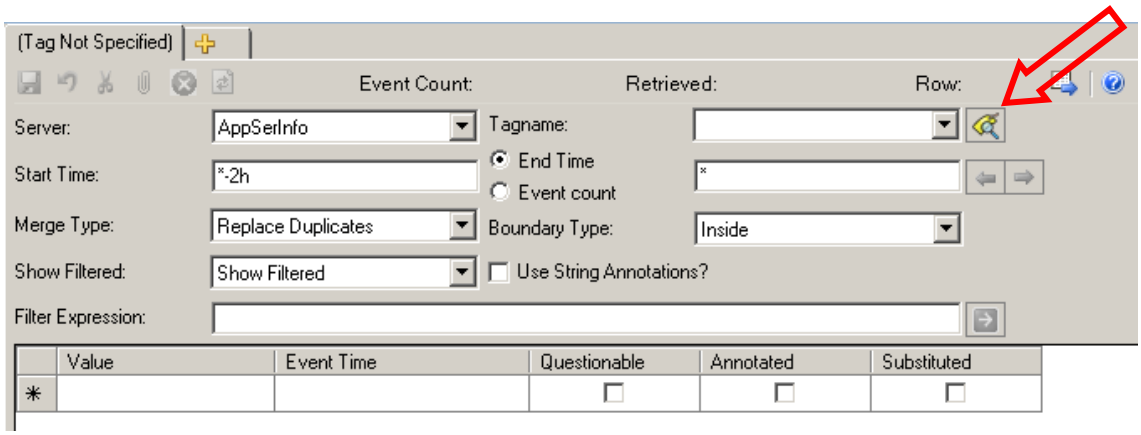


31. This Archive Editor will allow us display specific data points that have been previously archived within Historian.

"Historian SE / Batch Analysis"

If you are familiar with this Historian feature, you may skip ahead to step # 38 where we explore Current Values feature.

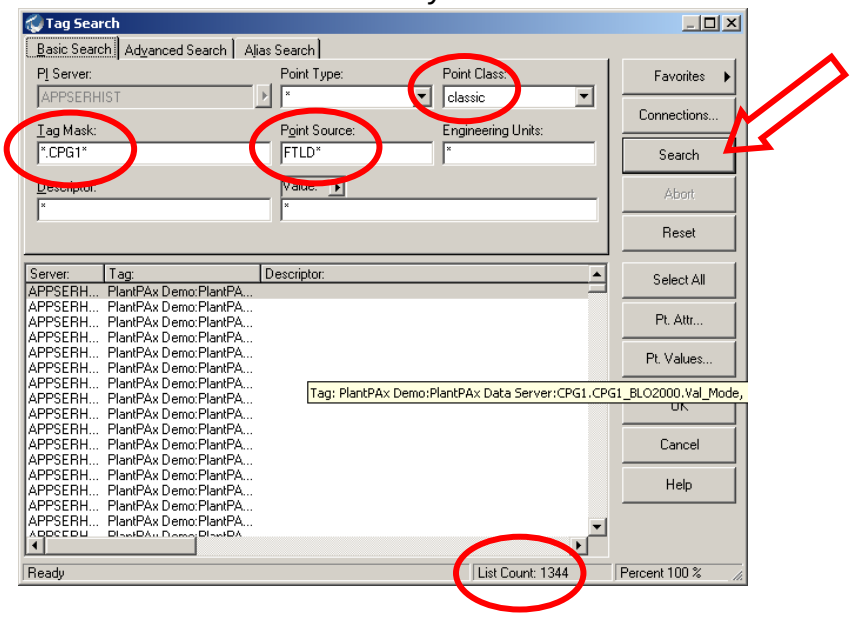
From the work area on the right there is an icon for the Tag Search launching a popup search window. You can browse tags in the system from this window. Please select this ***Tag Search*** icon.



Note: - this Tag Search icon will not be available unless the Historian server is checked.

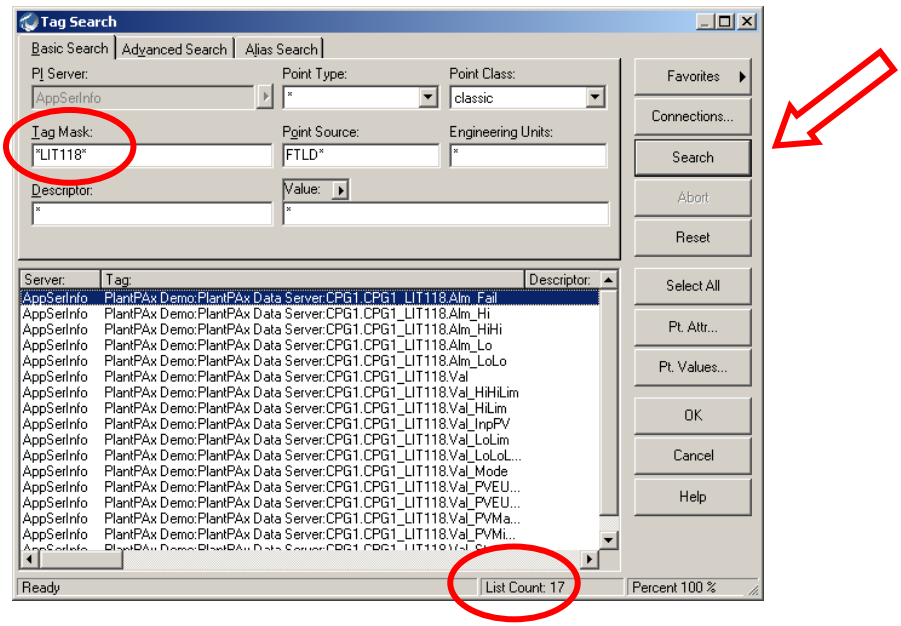
32. Within the Tag Search browser you may apply filters to reduce the number of tags in the return list. Select the ***Point Class*** to set its value to ***classic*** and choose ***Point Source*** as ***FTLD**** and set the ***Tag Mask*** filter setting its value to ****.CPG1**** to limit our display of points of interest for this lab. Select the ***Search*** button. How many are in the List Count?

"Historian SE / Batch Analysis"



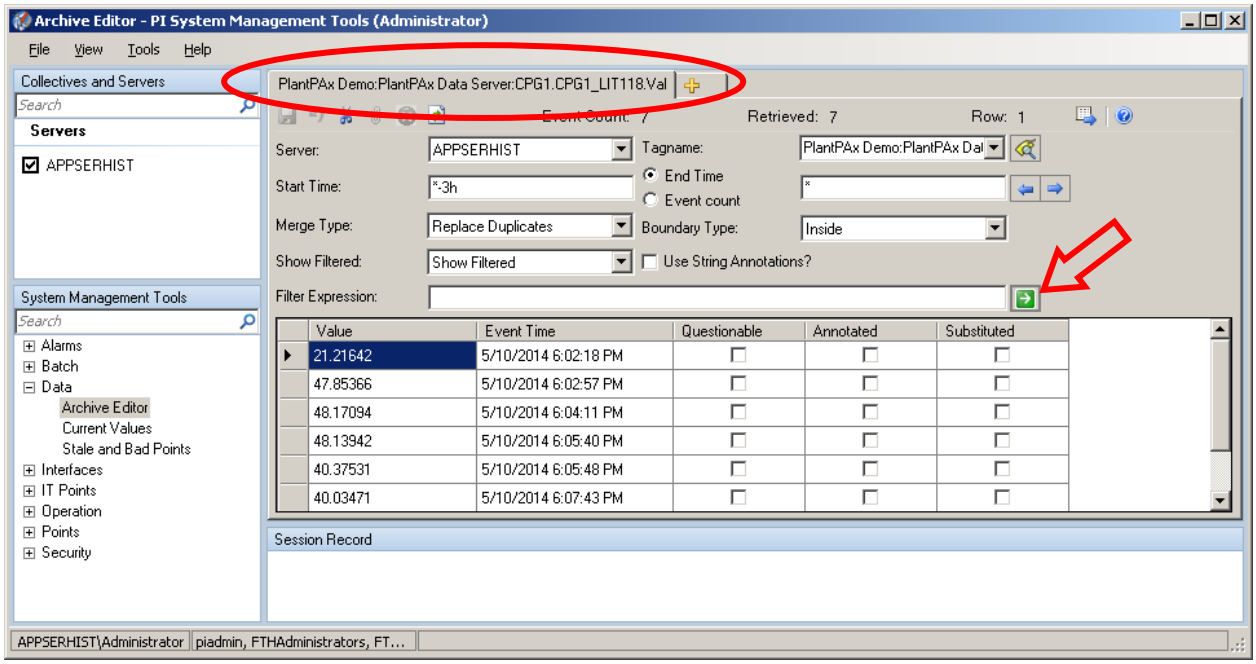
To see the tagnames, please expand the Tag column in the window list by clicking on it and dragging it wider. There are 1344 tags from CPG1 area being historized in the module database through a FactoryTalk Live Data connection to the controller.

Since we are interested in a few points, a better search would be to change the ***Tag Mask*** to be more specific like, ****LIT118****. Select the ***Search*** button. A much smaller list appears to manage through.



33. Scroll down the short tag list to find **CPG1_LIT118.Val** tag and select ***OK***. The tag will be added to the first tab. The start time can be changed from *-***2h** (2 hours) to something longer or shorter in

duration. Try a start time as ***-1d** (1 day), or ***-1m** (1 month), and just click the ***Get Events*** button, for a refresh of values:



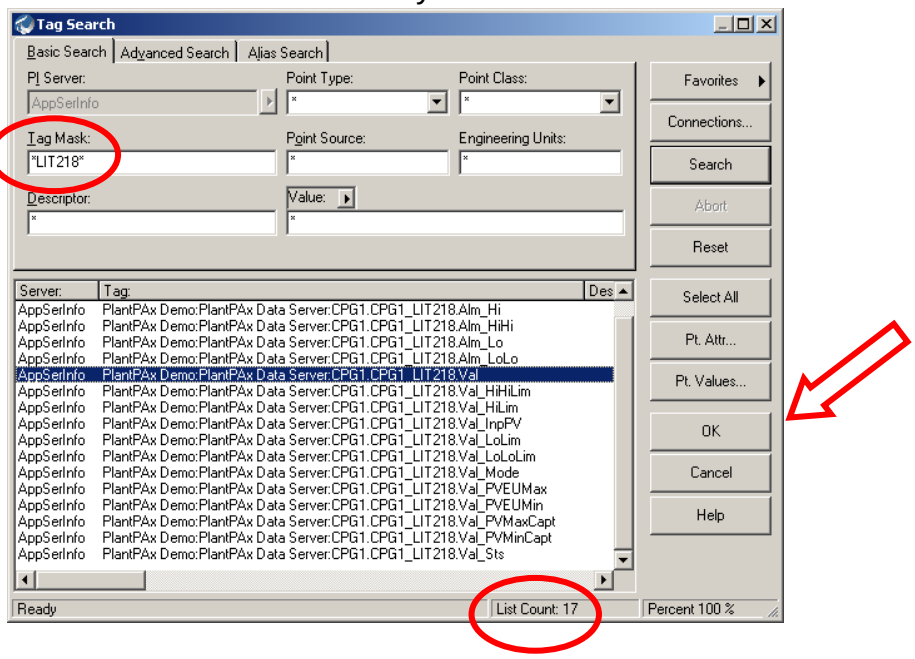
34. You can add another point by selecting the + tab to the right of the newly added point.

    Let's add one more point to the archive, ***select the + tab***

    To remove a point from the tab list, select it, and right-mouse click the tab to select Close Tab.

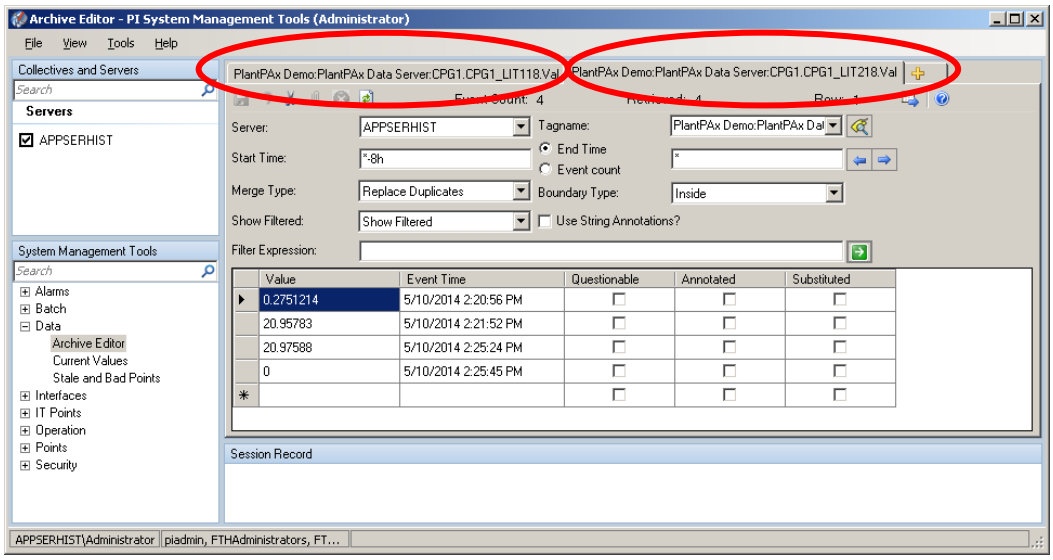
35. Do a tag search using the ***Tag Mask *LIT218****, then select ***OK***.

"Historian SE / Batch Analysis"



Scroll down the short tag list to find **CPG1_LIT218.Val** tag and select ***OK***.

36. You should see two points among two tabs in the archive editor.



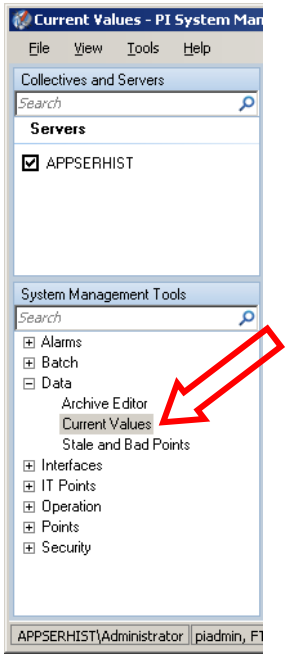
Note: you will not see data on these new points if you did not run batches during the time specified.

37. Another feature of this Archive Editor allows you to provide a substitute tag value for a point. It does not replace the existing point that was sent to archive previously in time, but it does provide a substitute value. This is good if it is known that there was an error or a bias in the data at a given time. You can also set a configuration parameter to not allow substituted values for data after a

certain amount of time has passed since the data was collected including never.

38. Now, we can look at current data values for the points that we are archiving. Within the same Data tree, there is a ***Current Values***, select this feature.

    If you are familiar with this feature of Historian, please skip ahead to PI SMT add-in at step # 44

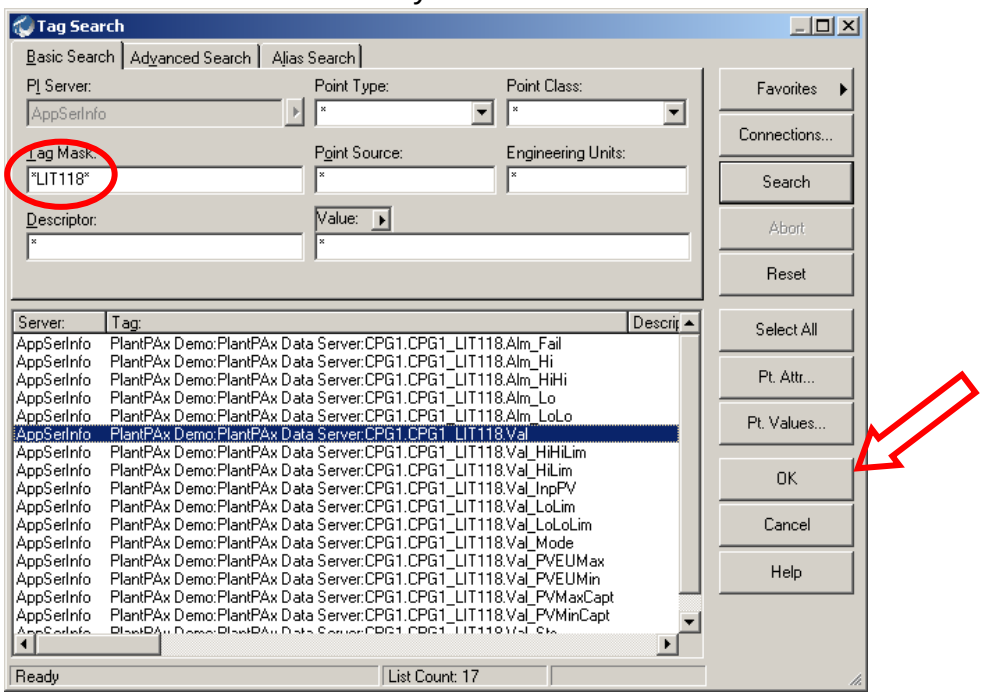


39. From the icon list, select the ***Tag Search icon*** . This action will bring up the Tag Search browser window.

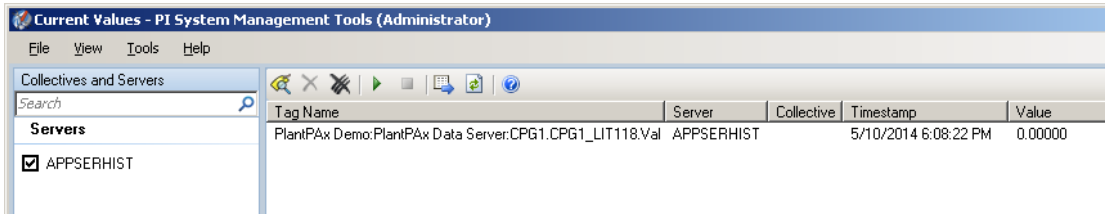
> **Note:** - this Tag Search icon will not be available unless the Historian server is checked.

40. Within the Tag Search browser, use the ***Tag Mask*** filter setting its value to ****LIT118 **** to quickly display our point of interest. Scroll down the tag list to find **LIT118.Val** recorded points.

“Historian SE / Batch Analysis”

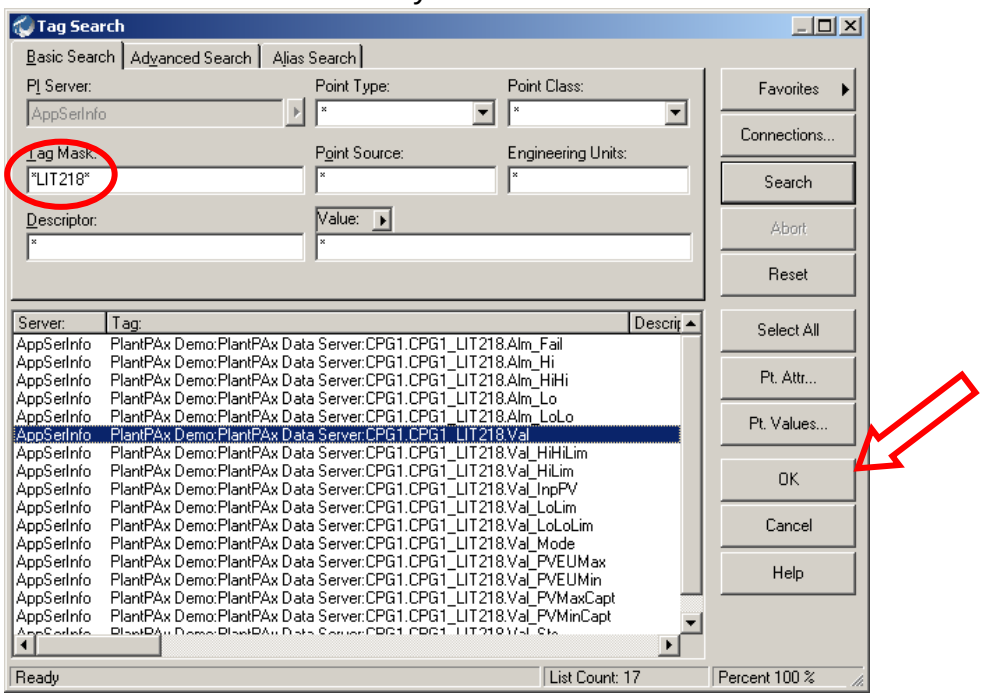


41. The point CPG1_LIT118.Val will be displayed with its current value as a snapshot.

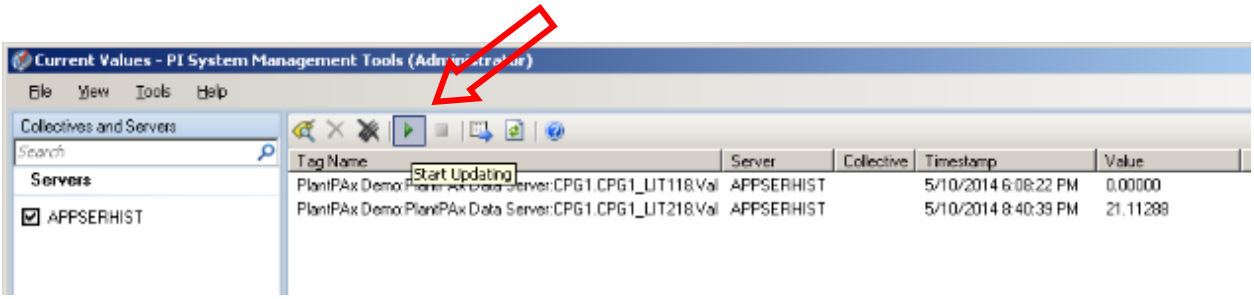


42. Use the Tag Search browser again . Set the ***Tag Mask*** filter setting its value to ****LIT218 **** to quickly display our point of interest. Scroll down the tag list to find ***CPG1_LIT218.Val*** recorded points.

"Historian SE / Batch Analysis"



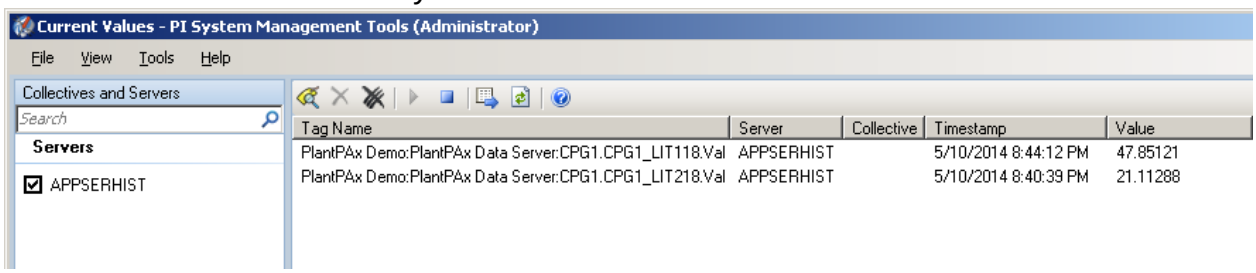
43. Now, both tags should be in the current value list as snapshots. To get current real-time updates, please select the start updating icon



Notice the data may not change if no batches are running in a reactor. If this is the case, add a batch to run against a reactor of your choice, and start it.

Data could be changing every second if there is a batch running in reactor 1 or 2. From this example (above and below) you can see that reactor 2 is static with a value of 21.11288, but reactor 1 has changed from the snapshot of zero to 47.85.

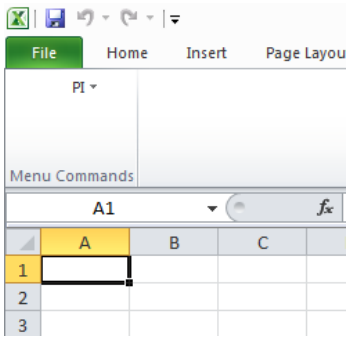
"Historian SE / Batch Analysis"



44. Let's examine how an engineer might use MS Excel with the PI SMT add-in to see what data points of interest are currently within the Historian. This spreadsheet import/export can provide a quick way of changing a large set of tags.

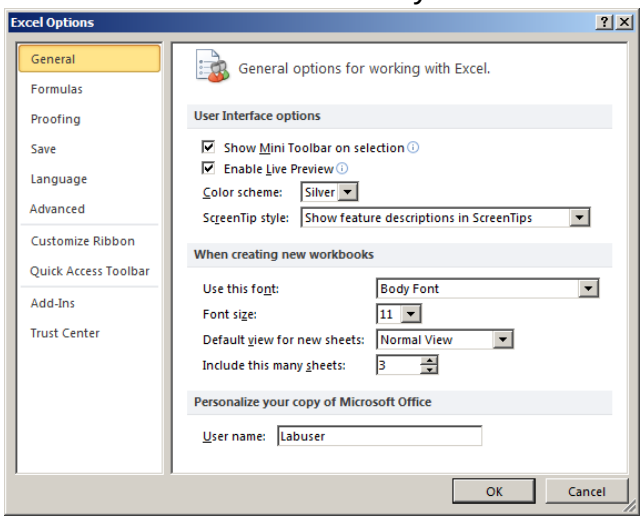
    If you are familiar with this feature, feel free to skip to next section, Section 3.

    Open MS Excel 2010.

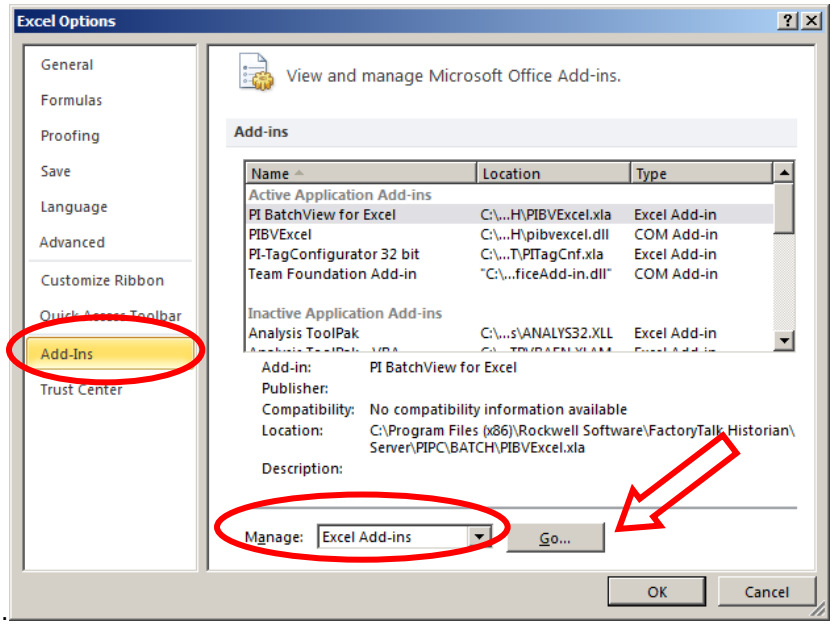


45. Select ***File > Options,*** this brings up the Excel Options window

"Historian SE / Batch Analysis"

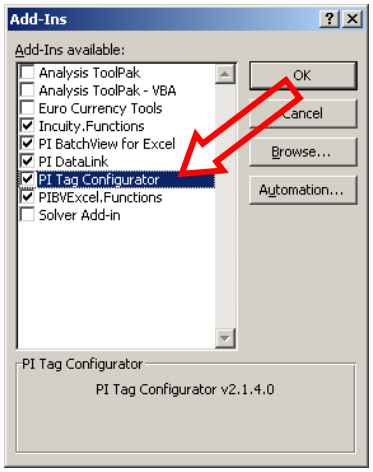


46. Select ***Add-Ins***



47. With Manage defined for ***Excel Add-ins***, ***select Go…*** to bring up the Add-Ins window seen below:

"Historian SE / Batch Analysis"

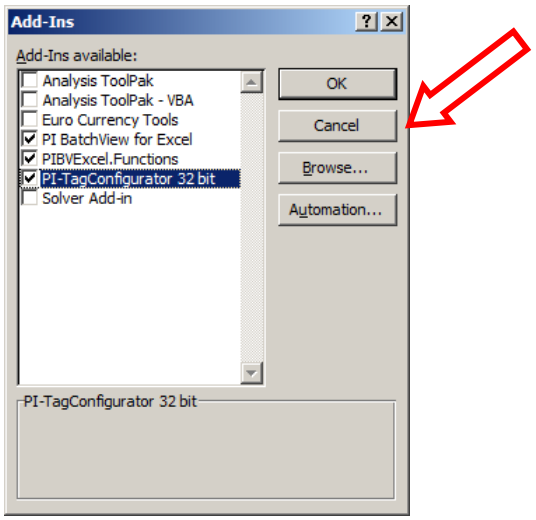


From this Add-Ins window, we see PI Tag Configurator has been added all ready. If it were not there, you would want to select the ***Browse button*** to find the recommended file and location. It should be located at:

C:\Program Files (x86)\Rockwell Software\FactoryTalk Historian\PIPC\SMT

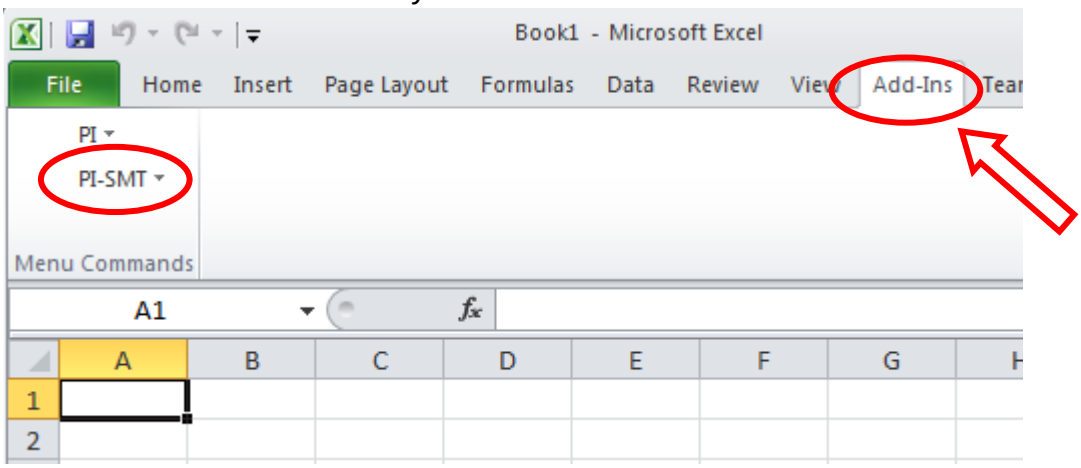
The filename is PITagCnf.xla

48. If it is there already, please select the ***Cancel*** button.

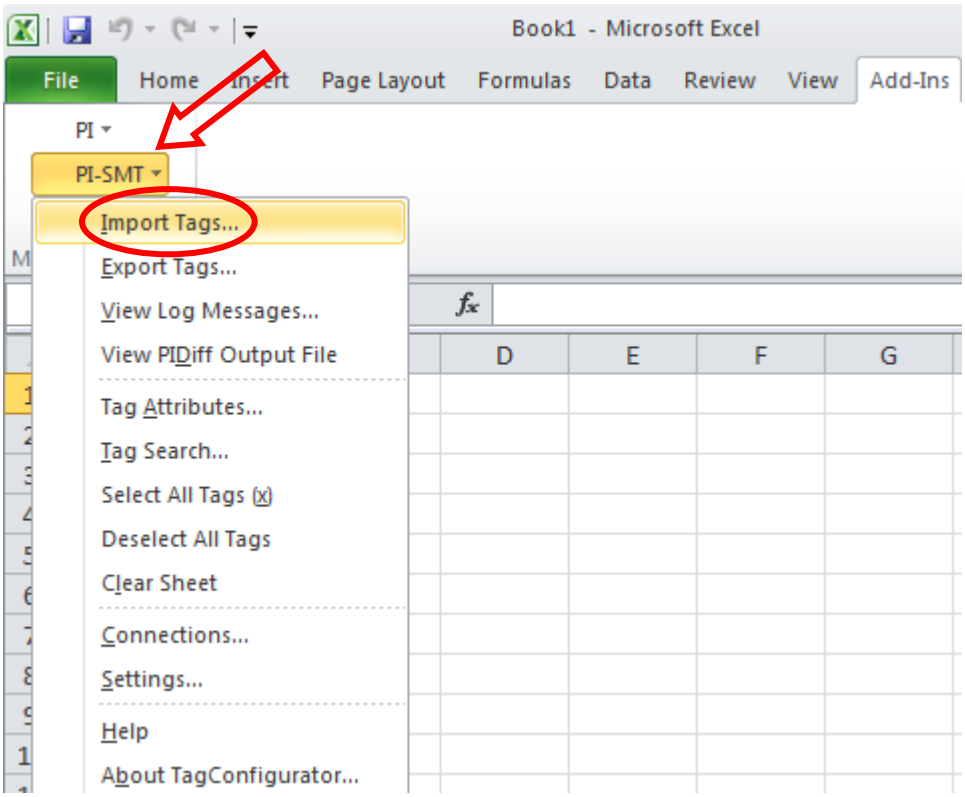


49. With this Add-In, you will be able to see the PI SMT Add-In when you select Excel's Add-Ins menu tab

"Historian SE / Batch Analysis"

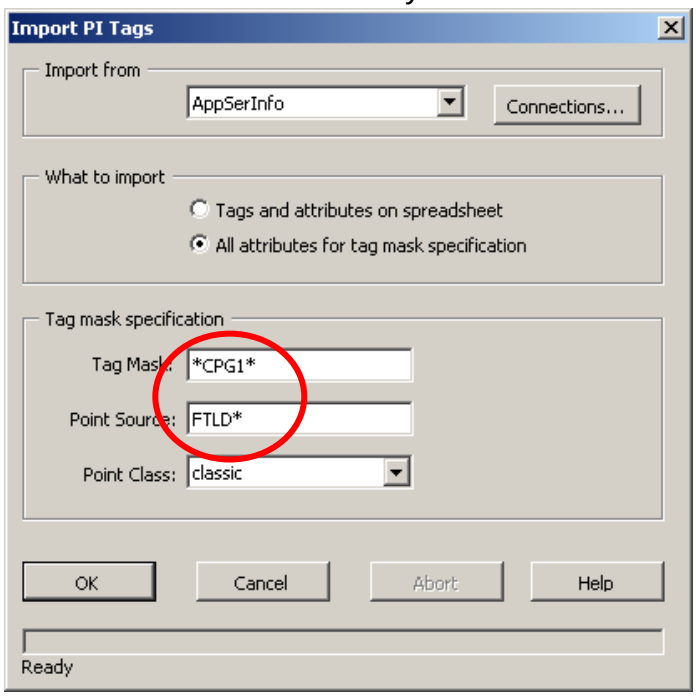


To get tags from Historian into the Excel spreadsheet, ***pull-down your options from PI-SMT Select Import Tags…***



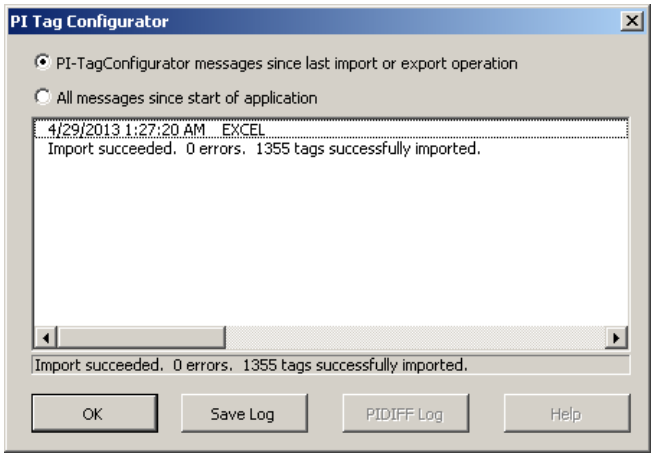
50. From the **Import Tags** window, ***add FTLD**** to the Point Source, and ****CPG1**** to the Tag Mask

"Historian SE / Batch Analysis"



51. ***Select OK,*** it will fetch PI tags for the spreadsheet. This may take a minute as it fetches over 1000 points.

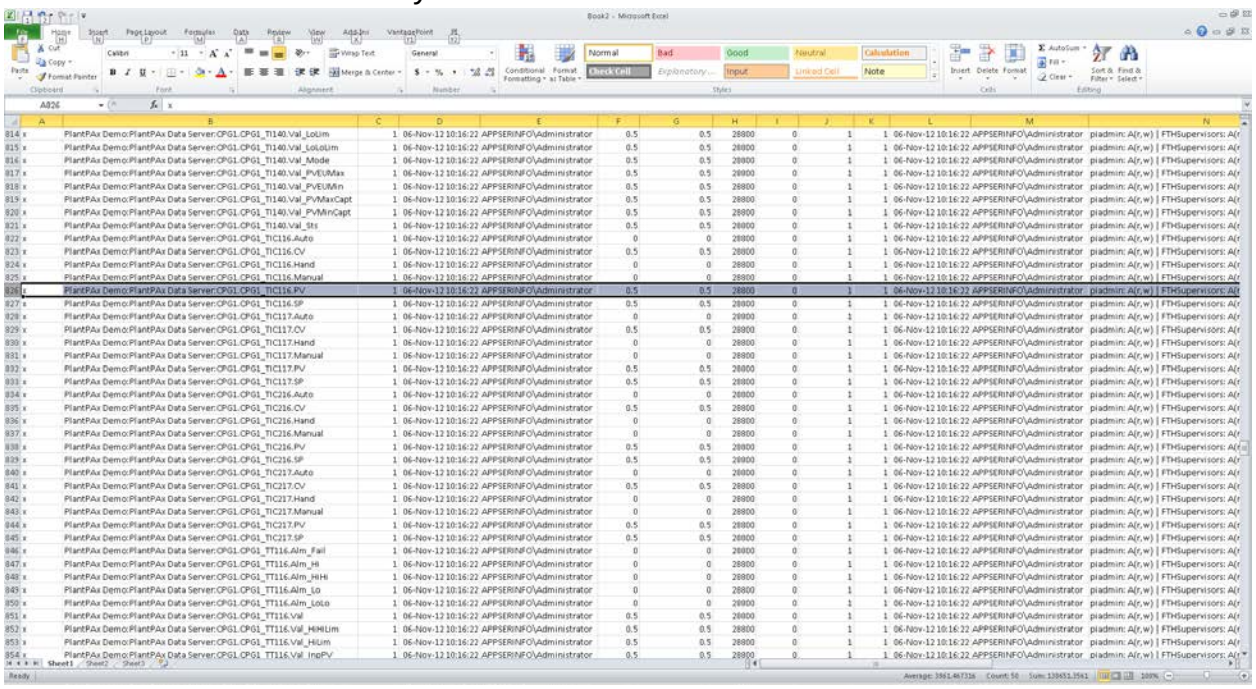
52. The PI Tag Configurator window appears, ***select OK***



Notice: there were 0 errors, and 1359 tags successfully imported. You could reduce this number of points based upon the granularity of your tag masks.

53. If you are interested go to the Home menu to use the FIND feature in Excel to locate some of those points we had mentioned earlier. If not, just ***close Excel***.

"Historian SE / Batch Analysis"



NOTE: All the FactoryTalk Historian tag attributes are displayed in each record on the worksheet. This allows you to document, create, and edit tags on a global scale. Exporting them back into Historian gives you an efficient way to manage Historian tags...

54. Congratulations! You have successfully added new data points to the Historian and verified them by several methods. Later, you can trend this data overlaid with your batch execution data through the Batch View's engineer perspective. In the next section, we will explore the Interface Configuration Utility – ICU, and the System Management Tool - SMT to get the engineer's perspective on the FactoryTalk Batch Interface.

Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

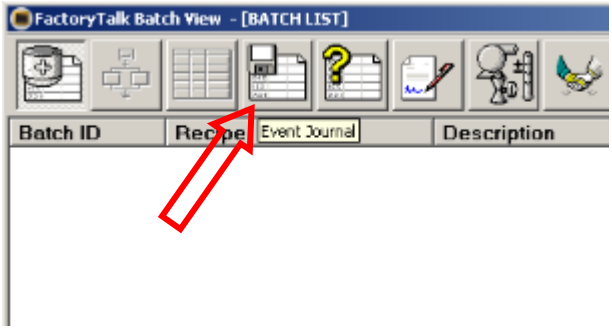
Section 3 – Engineer's take on the FactoryTalk Batch Interface

The new FactoryTalk Batch Interface requires configuration for the Historian to receive data from the batch records. This software was loaded on the AppSerBatch node where the FactoryTalk batch server resides. This may not be the best location to load the interface software due to potential resource contention with the batch server, but for this lab it is a convenient option.

You can observe the current connections within the FactoryTalk Administration Console for the Network. Currently, a FactoryTalk Live Data connection exists named, FTLD1. The FTLD1 connection is how Historian will collect time series tags from the controller as we observed in the previous section. The FactoryTalk Batch Interface will not appear in the FactoryTalk Administrator Console. The PI Interface Configuration Utility will tell you where the PIFTBOInt1 interface is installed. The data which this interface transfer to the Historian module database is very different than a controller tag. Through this interface, it is batch journal data that will be pushed from the FactoryTalk Batch Server's event journal directory into the FactoryTalk Historian SE Module database when the interface is running and new batch journal data exists.

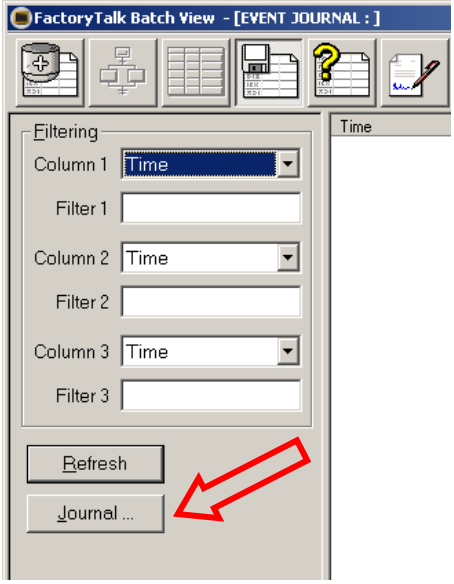
During normal production the resource impact of the FactoryTalk Batch Interface is not usually an issue of concern. However, if you are starting this interface for the first time, or the interface has not been running for a period, yet many batch journals have been produced since that time, you will need to exercise some caution upon starting this interface. If a large number of event files exist in the journal folder, the interface will consume massive amounts of system resources to check all evt files – both archived and not archived. Moving older evt files that have been archived out of the production journal folder, or limiting the amount of time which the interface can check past batches may help contain this potential issue.

1. For this lab the Batch Event interface was installed on the batch server image. Please go to the ***AppSerBatch*** VMWare image.
2. Before we start, let's examine what batch journal file data looks like. We could use the FactoryTalk Batch View application to examine some of this data, or we could open an existing journal file using Windows Explore and any ASCII text file editor such as Notepad.
3. ***Open*** the FactoryTalk Batch View application, and ***select*** the Journals view,

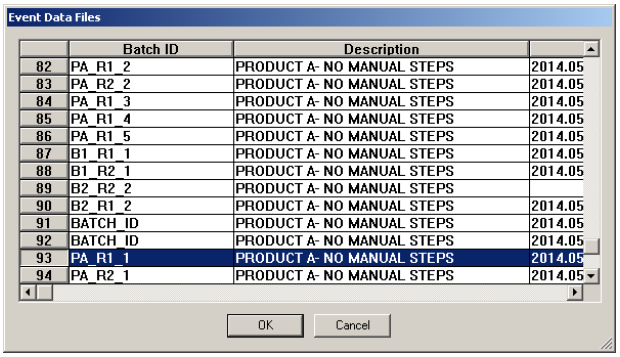


4. From the event journal view, ***select*** the Journals search button,

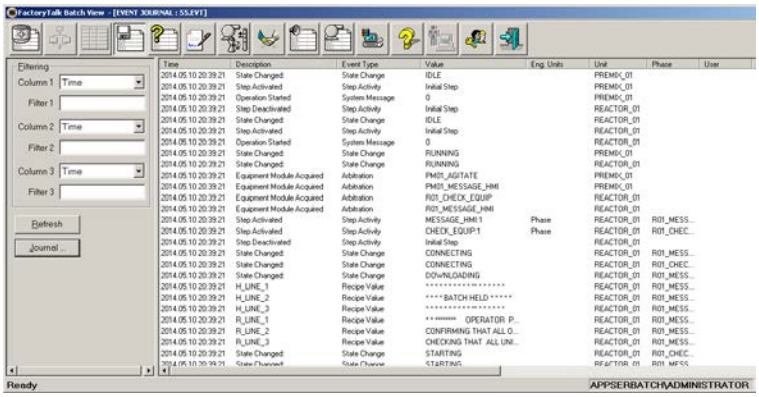
“Historian SE / Batch Analysis”



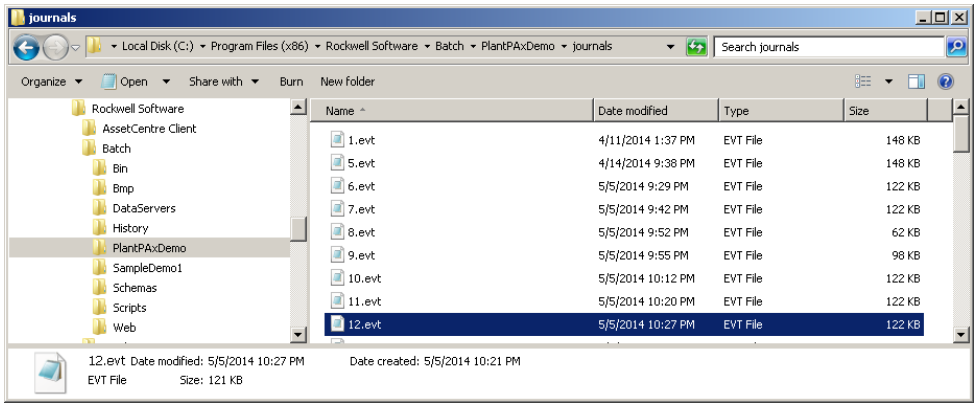
5. From the list of batch journals that is displayed, ***select one and press OK***,

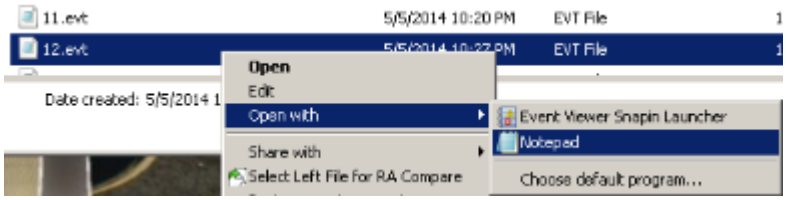


Please take some time to observe and explore the results which is data contained by an event journal record for a specific batch, or control recipe. They are event descriptions and values with a time.

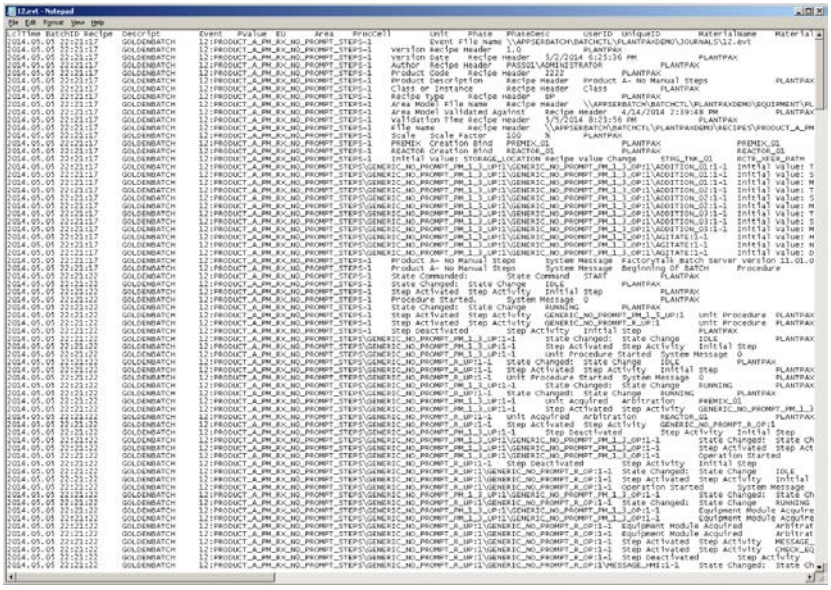


6. The same data could be examined through Notepad, Wordpad, or Excel. ***Use Windows Explore*** to find an .evt file of interest and ***open it with Notepad*** using right-mouse click on the file,





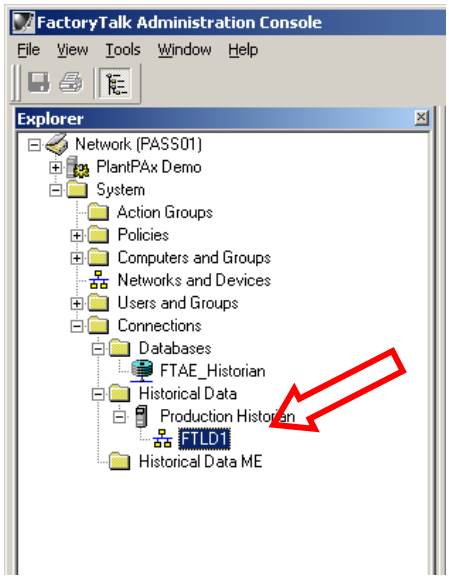
7. It will display all the details about a specific batch record,



8. Spend a minute looking at the different entry records within the log. Much of this data is what the Historian will be capturing within it's module database.
9. From the AppSerHist image Start Menu shortcut list, select **FactoryTalk Administrator Console**.

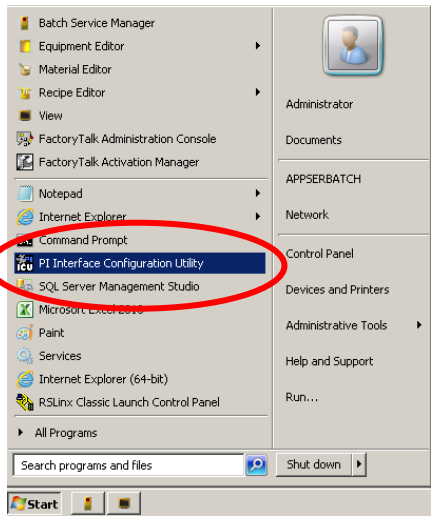
"Historian SE / Batch Analysis"

Open ***Connections\Historical Data\Production Historian***



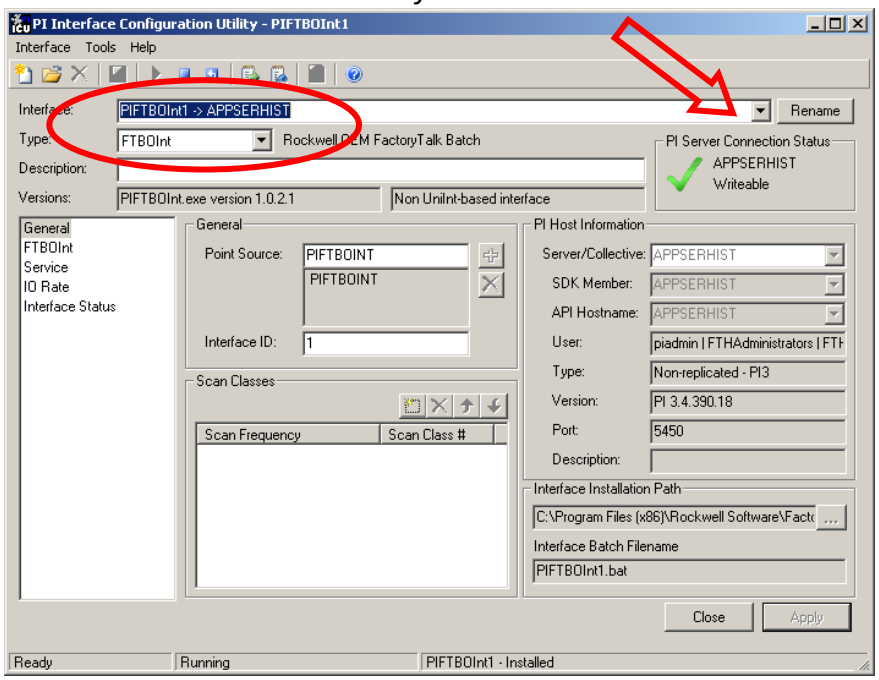
You can observe the current connections defined within the FactoryTalk Administration Console for the historian. Currently only, a FactoryTalk Live Data connection exists.

10. On the AppSerBatch VMWare image we will examine and start, if stopped, the FactoryTalk Batch Interface, please launch the ***Interface Configuration Utility***, or ICU from the Start Menu on the machine that the new FactoryTalk Batch Interface was loaded (i.e. AppSerBatch).



11. From the Interface Configuration Utility, we will see that there exists the interface PIFTBOInt that was preconfigured for this lab. Please pull-down the interface window to select the FactoryTalk Batch event interface, ***PIFTBOInt -> APPSERHIST***

"Historian SE / Batch Analysis"



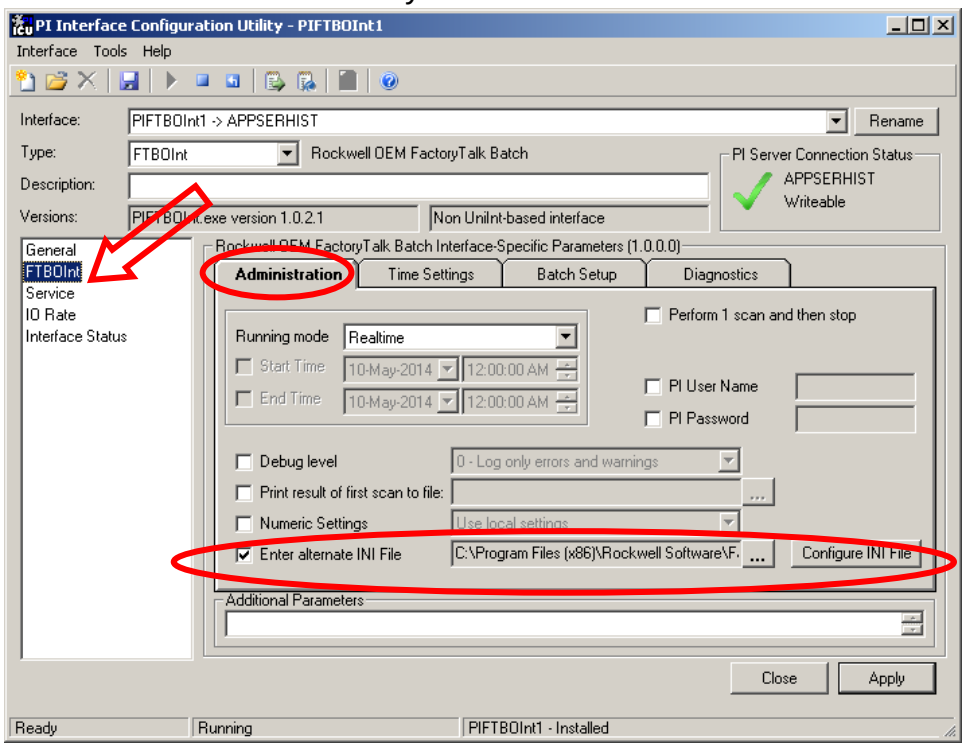
The General window provides information about the interface such as point source, scan classes, connection status with the Historian, user, version, port, etc. Please note that the batch interface does not use typical scan classes since data is being pulled from event journal files. Also notice, the General window tells you where the Interface was installed:

C:\Program Files (x86)\Rockwell Software\FactoryTalk Historian\PIPC\Interfaces\FTBOInt

where the .bat file, **PIFTBOInt1.bat**, is located.

12. ***Select FTBOInt*** in the left side of the interface utility to bring up the configuration window. Notice that the **Administration tab** defines information about the interface including the mode and start date/time for the interface to begin archives.

"Historian SE / Batch Analysis"

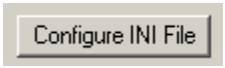


The alternate INI file is an important part of the interface configuration. It defines the location for the batch records to archive, and what data to transfer into the Historian. Its current path is defined as:

C:\Program Files (x86)\Rockwell Software\FactoryTalk Historian\PIPC\Interfaces\FTBOInt

where the ini file, **PIFTBOInt_RA.ini**, is located can be verified by selecting the browse button,

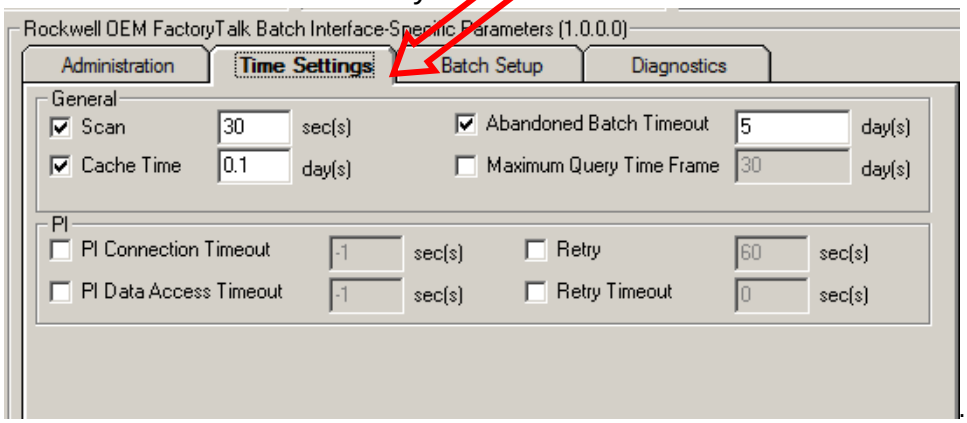
13. To examine the contents of the Configuration INI file, select the Configure INI File button,



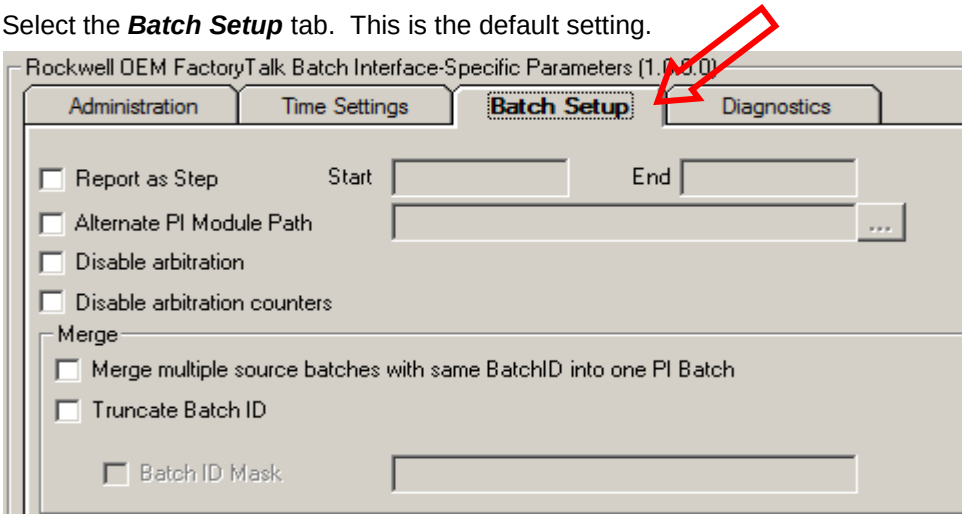
However, the configuration of this file is outside the scope of this class, and there should be no strong reason for why an end user would want to make changes to it.

14. Let's look quickly at the other tabs, *select the **Time Settings*** tab. This is the default setting.

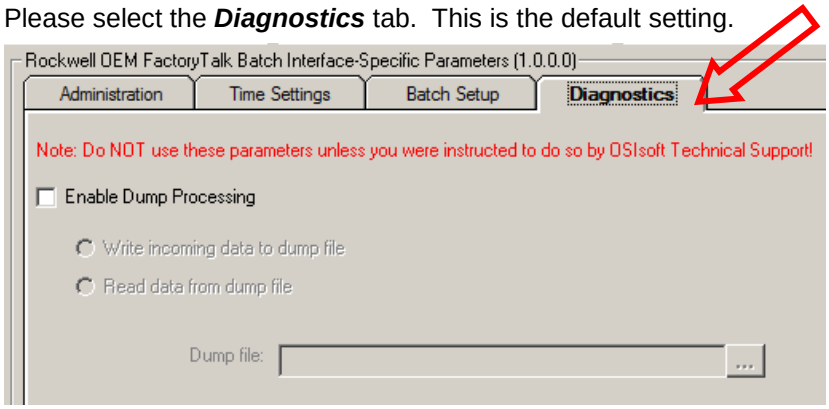
"Historian SE / Batch Analysis"



15. Select the ***Batch Setup*** tab. This is the default setting.

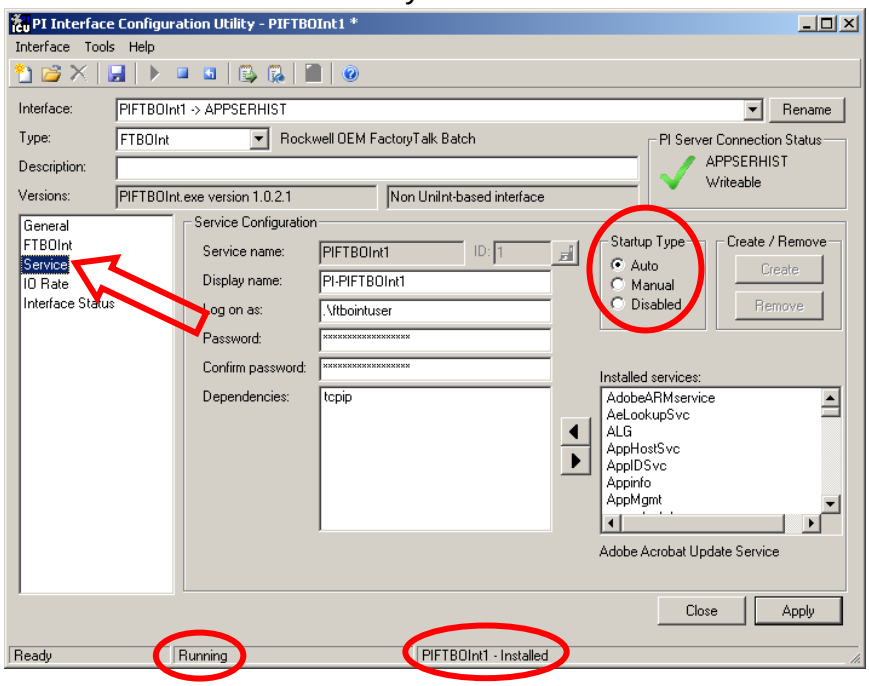


16. Please select the ***Diagnostics*** tab. This is the default setting.



17. Please select ***Service*** in the ICU. Notice here that the Startup Type is set to ***Auto***. The ICU should be running upon boot of the O/S when startup type is auto. If it were not, there are command buttons on the toolbar under the menu that allow you to stop and start the interface.

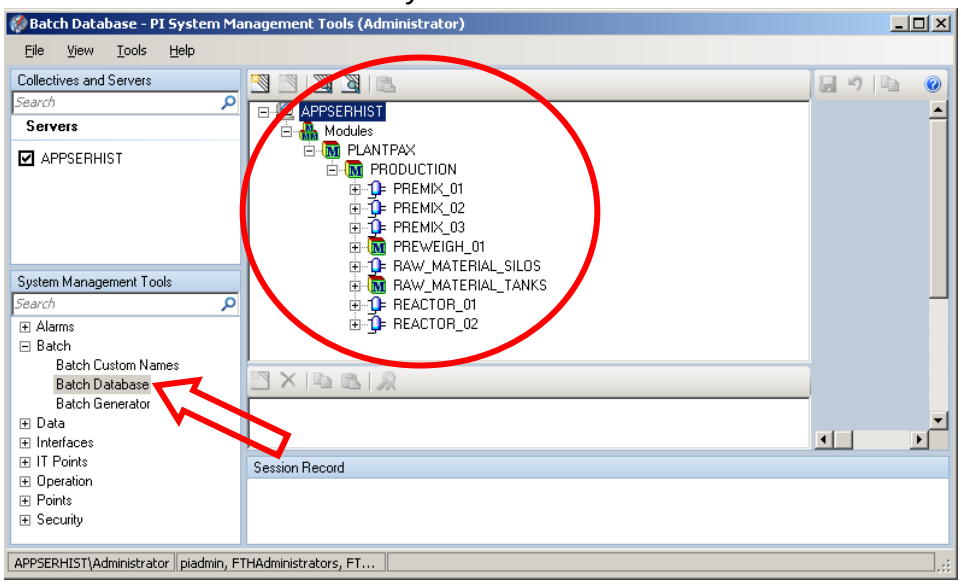
"Historian SE / Batch Analysis"



18. The service configuration includes Windows security authentication information and service dependencies for the ICU service. In the ICU utility window, the ***IO Rate*** doesn't apply to this interface, and ***Interface Status*** provides minimal information.

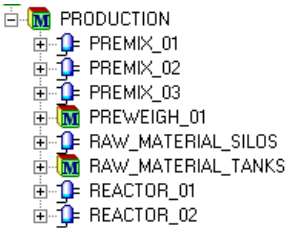
19. Please ***switch back*** to the FactoryTalk Historian SE image ***AppSerHist***. The FactoryTalk Batch Interface dynamically builds the equipment model and phases within its database. If this was a new install of the interface and the Batch Interface and you had previously run no batches, the equipment database would be empty for the initial image. Once a batch is archived, the equipment (units, and phases) will be built dynamically for you. If you happen to add new units, or phases to your batch system in the future, the Historian database will dynamically update its model as soon as a phase or unit is recorded into any batch journal that is pushed to the Historian. To observe this database, you must go to the Historian image, AppSerHist. Next, go to the System Management Tool - SMT, ***select Batch*** to open and the ***Batch Database.***

"Historian SE / Batch Analysis"

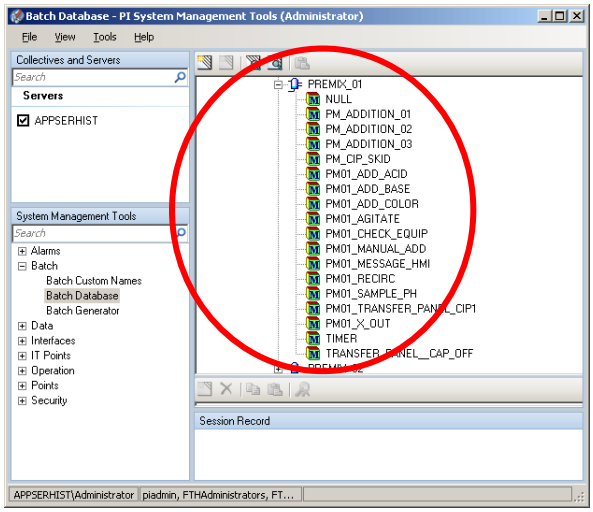


20. Expand the tree ***AppSerHist***,. Upon opening the tree you will see units under PRODUCTION. Within each unit, there will be phases which were run by recipe operations against that unit. If no recipes have ever been run, there would be no units, or phases in this tree

    UNITS are:

    Expand the tree for PREMIX_01 to observe all the phases within that unit,
    UNIT(PREMIX_01)\PHASES are:

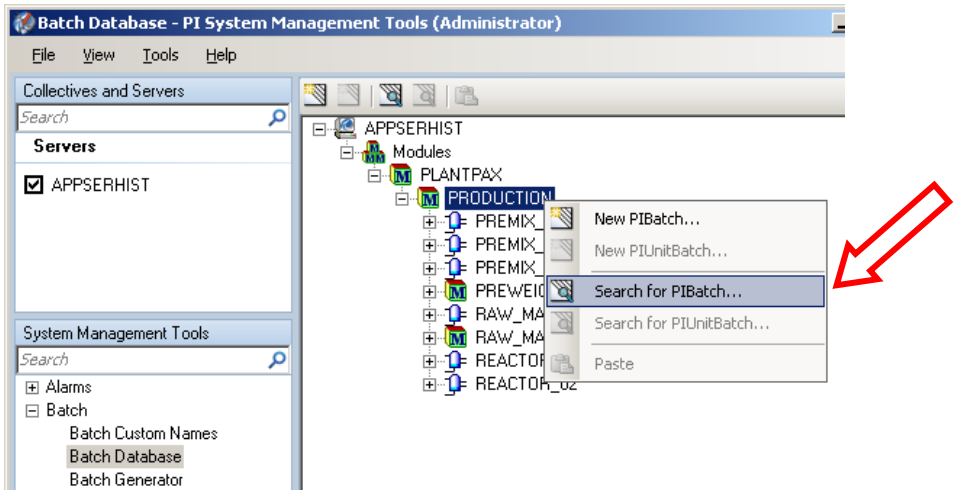


Lab 4: Factory Talk Batch

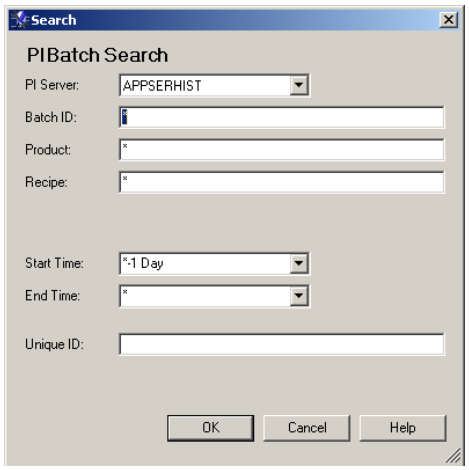
"Historian SE / Batch Analysis"

> **NOTE:** As the FactoryTalk FactoryTalk Batch Interface moves the batch journal file information into the Batch Database, this equipment hierarchy is dynamically built. The tree above will include only the unit equipment, operations and recipe/equipment phases from the batches that have been run.

21. From here we can perform a database search for all batches. ***Right-Click*** on ***Production*** and select ***"Search for PIBatch"***

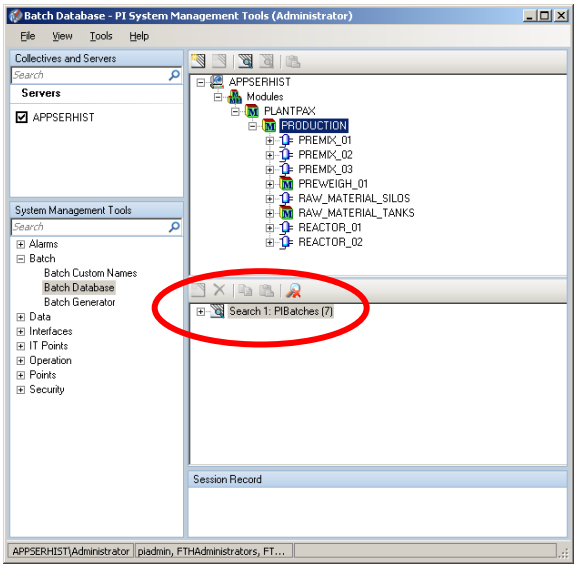


22. The Search window will appear. Select the ***OK*** button with the default search. The default will find all batches produced in the past day. To include more batches, you could change the start-time search from Day, to Days where 90 Days is approximately 3 months, 60 Days is approximately 2 months, etc.

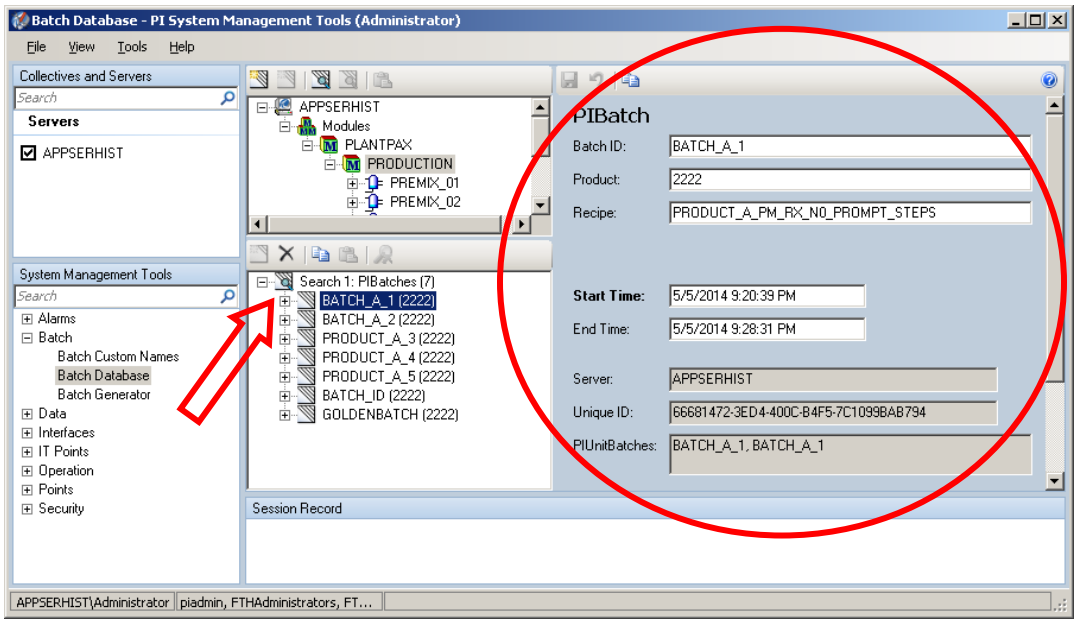


"Historian SE / Batch Analysis"

23. With *-1 Day specified, ***select the OK*** button, notice that it has found 7 batches on my system in the past day. It should show you all the batches that you have created today which may only be 4 to 6.

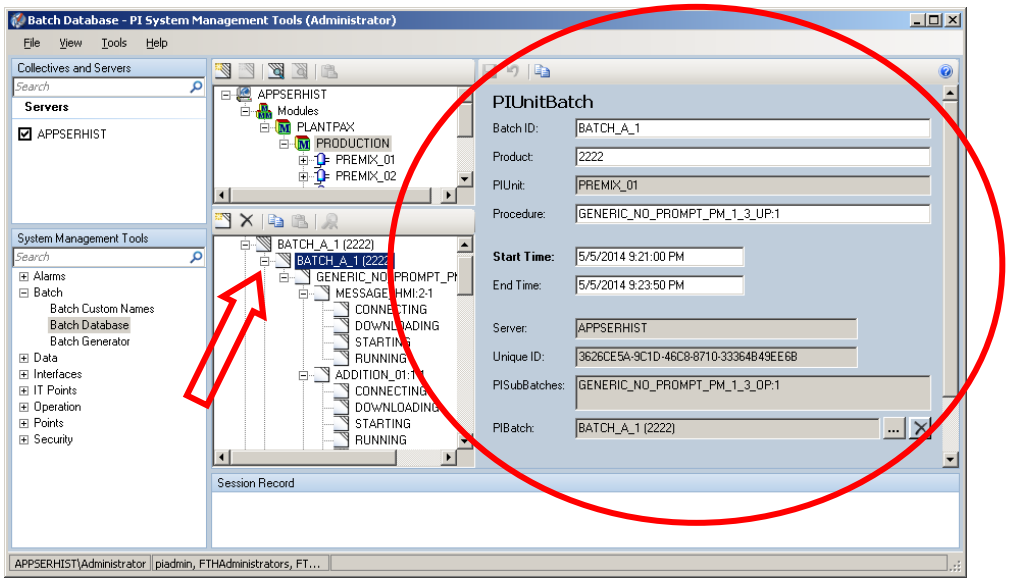


24. ***Expand the search results***, and select one of the batches within the list tree. Upon selecting a particular batch, detailed information about the batch is provided: Batch ID, Recipe, Start Time, End Time, PIUnitBatches, etc.

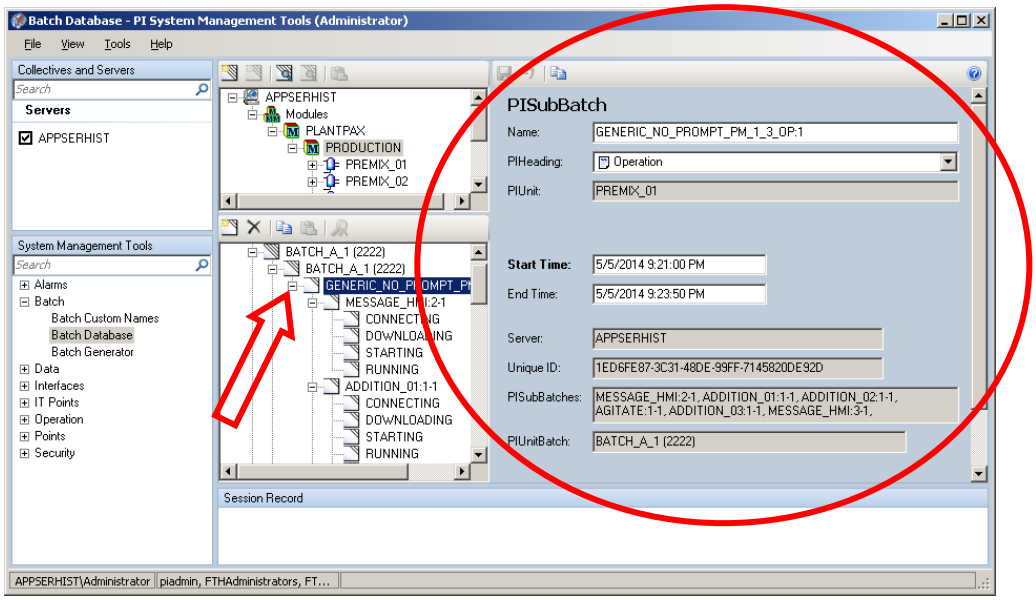


"Historian SE / Batch Analysis"

25. Now, ***select one of the batches to expand***, observe that all units/unit procedures run within the batch will be displayed. This will give you detailed information about the unit procedure that ran against the unit chosen.

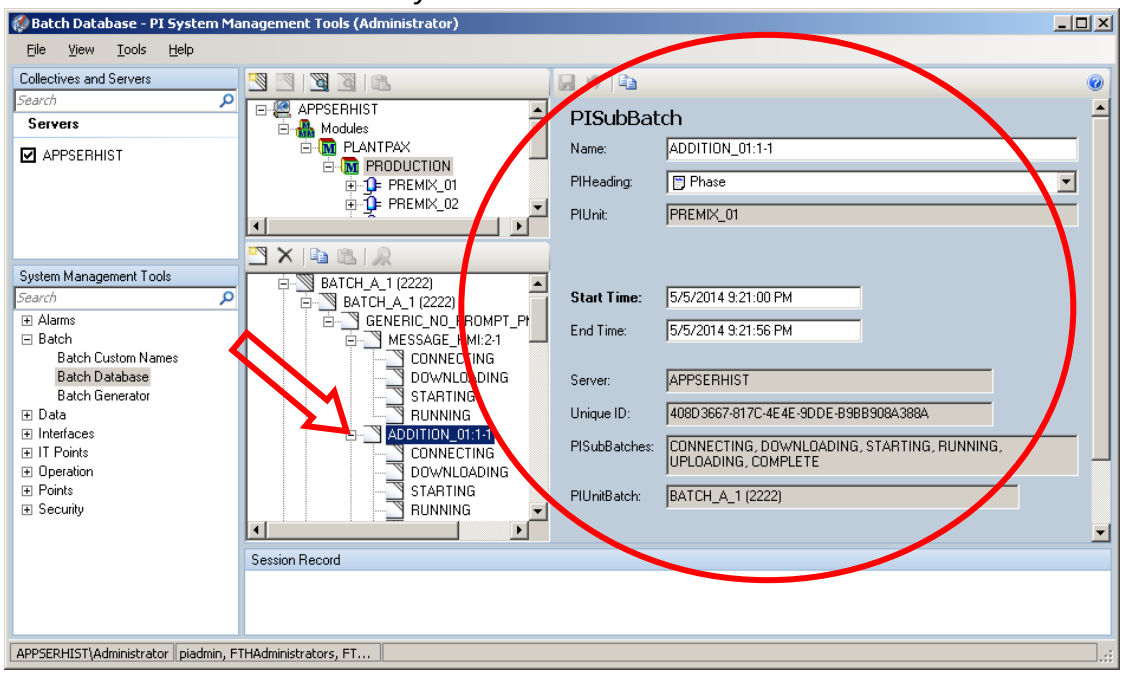


26. ***Expand each of the units*** within the batch. This will give you the list of equipment operations that ran within the unit procedures for the units within the batch. ***Select an operation*** for detailed information that is stored within the historian for that procedure level.

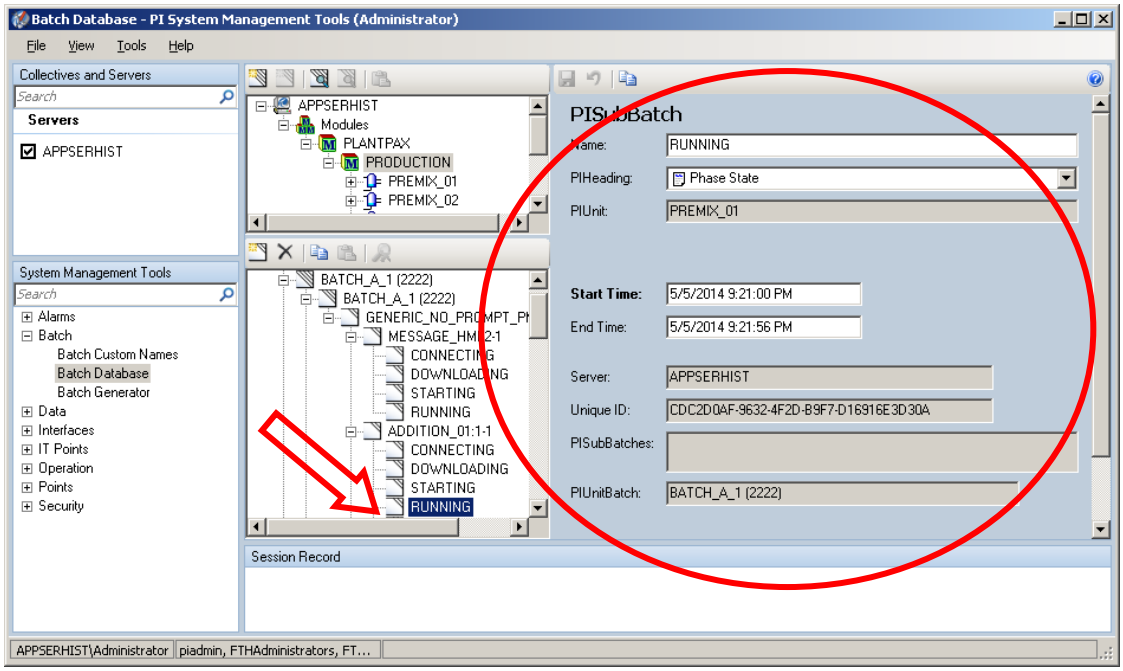


27. Expand the operations for a list of recipe/equipment phases that ran within the batch. ***Select a recipe/equipment phase*** within the operation for details about the phase.

“Historian SE / Batch Analysis”



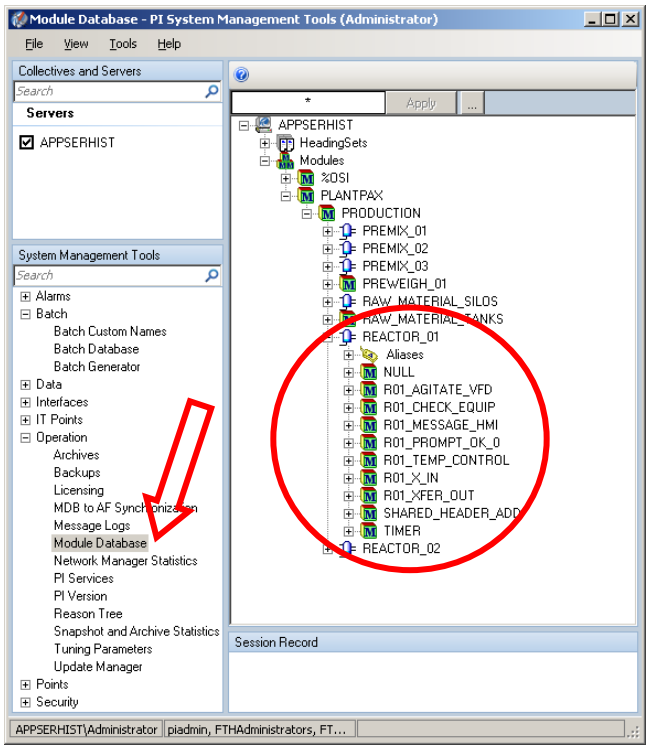
28. Open a recipe/equipment phase listed within the operation, here you see the various states which the phase had during its lifespan. Select one such as Running, notice the details captured,



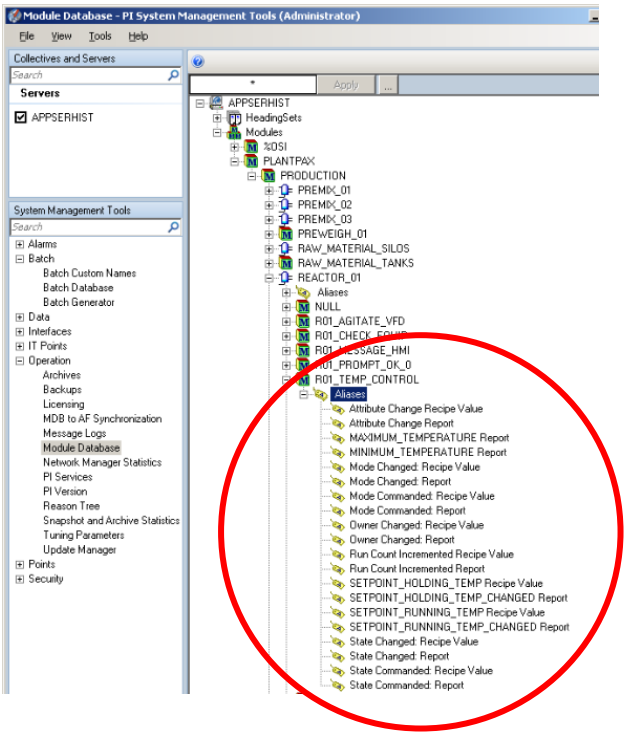
29. Did you notice that there was no formula value data, no report values on any of these details for each level of the database? If you wish to use the SMT to investigate a phase’s data such as download

"Historian SE / Batch Analysis"

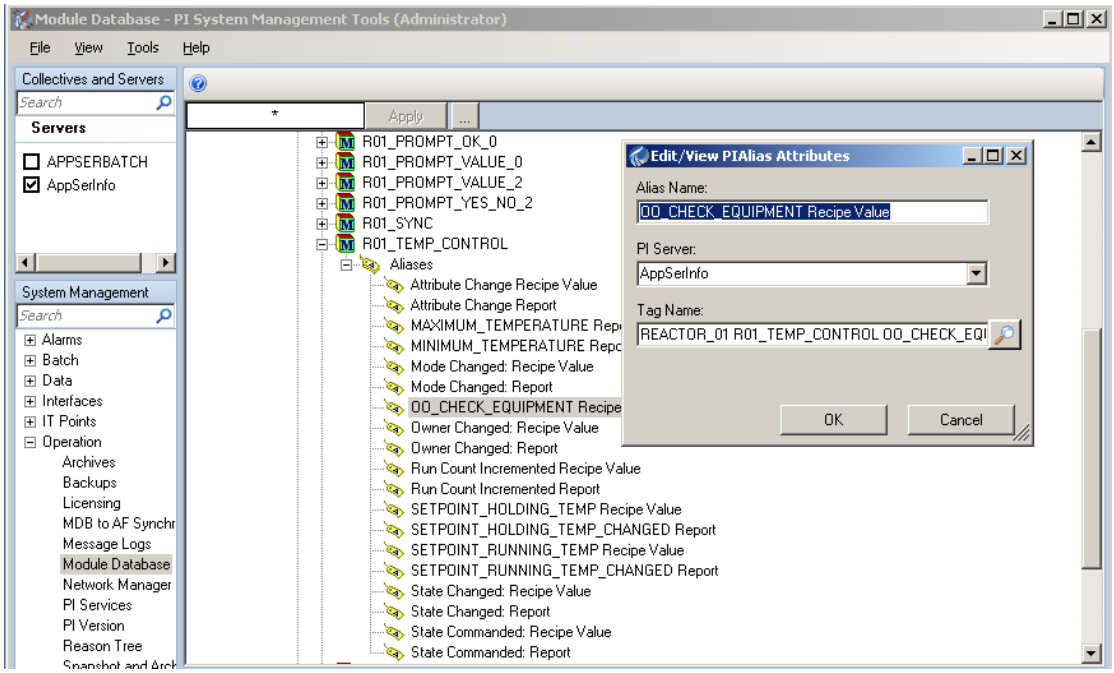
parameters, report upload parameters then the Module Database is where you need to go. In the SMT, **open *Operation*** and ***Module Database***. ***Expand*** the tree to the reactor unit, then ***open up*** Reactor_01 to observe all equipment phases within that unit.



30. **Expand** on the equipment phase **R01_TEMP_CONTROL**, and the Aliases folder,

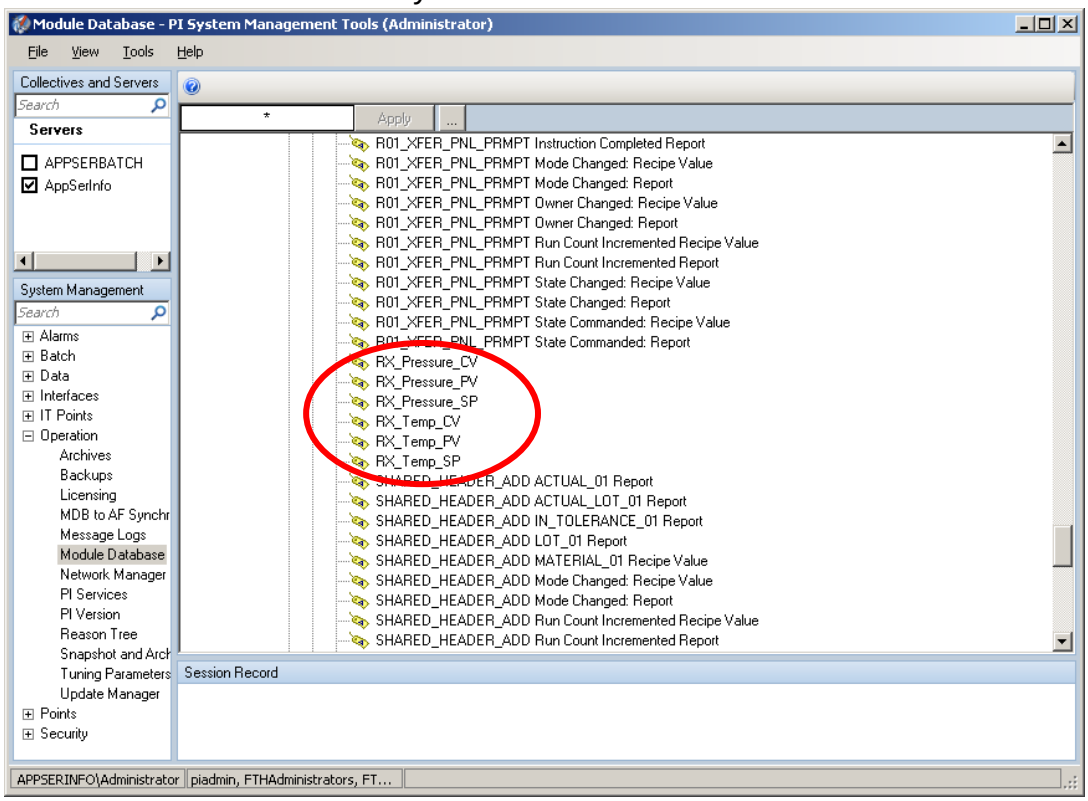


31. The Aliases folder within the equipment phase stores a list of the phase Aliases - Alias Names and Tag Name references. ***Double click*** an ***Alias*** item to get the Attribute popup window, select ***Cancel to close*** popup

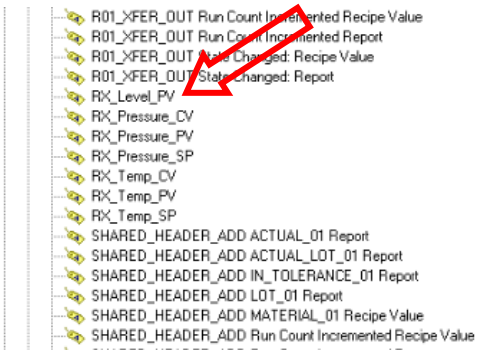


32. Go up to the REACTOR_01 unit, expand the ***Aliases folder*** under the unit. ***Scroll through the list*** of Aliases until you reach the end. As you see, the previous Aliases for all the phases that we observed earlier are listed there as well. In addition, you can observe some time-series Alias tags (i.e. ***RX_Temp_PV***, ***RX_Pressure_PV***, etc.) that were previously built by the engineer.

"Historian SE / Batch Analysis"



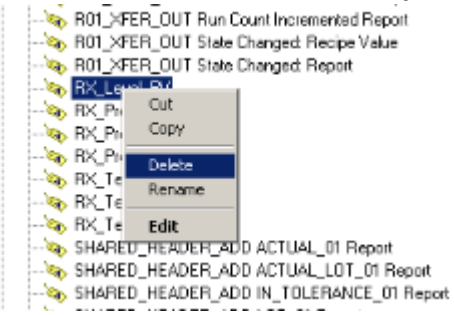
33. Notice that your newly added level indicators should not be present in the list of Reactor 01 unit aliases. You have not assigned an alias name to the actual device tag for the unit. While we have not done that yet, it may be possible that it was left over in the image you are working on.



If so, you can delete this RX_Level_PV alias, and build it per the following instruction steps with some caution; it may take several minutes to delete this alias if it exists. If you are short on time at this point, skip to the next section of the lab, section 4 using Process Book when the alias has been built.

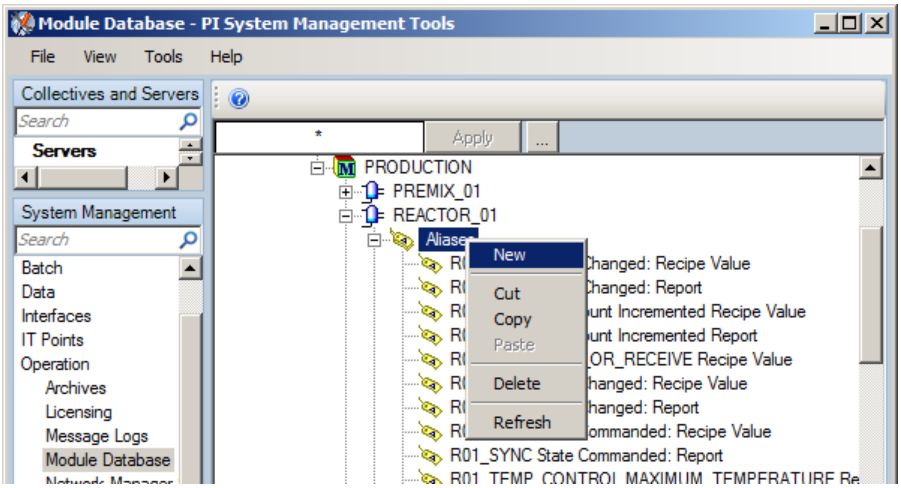
To delete, select RX_Level_001, right-mouse click for a delete action,

"Historian SE / Batch Analysis"

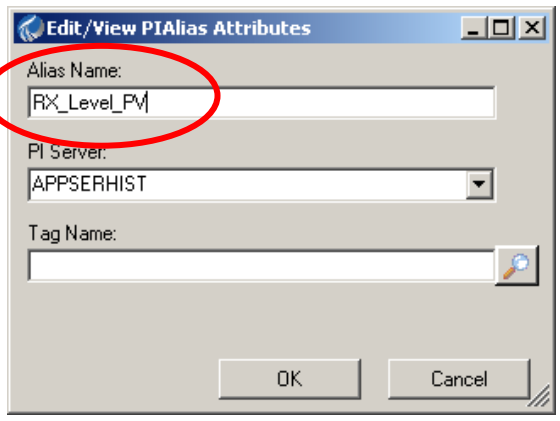


34. The remainder of this section will show you how an alias such as RX_LEVEL_PV can be tied to tags across multiple units, reactors in this case. Let's quickly do this for Reactor 01 and Reactor 02 level tags that we added earlier as though they were new Historian points.

    Select the ***Aliases*** folder under the unit REACTOR_01, right-mouse click to add a ***New*** alias.

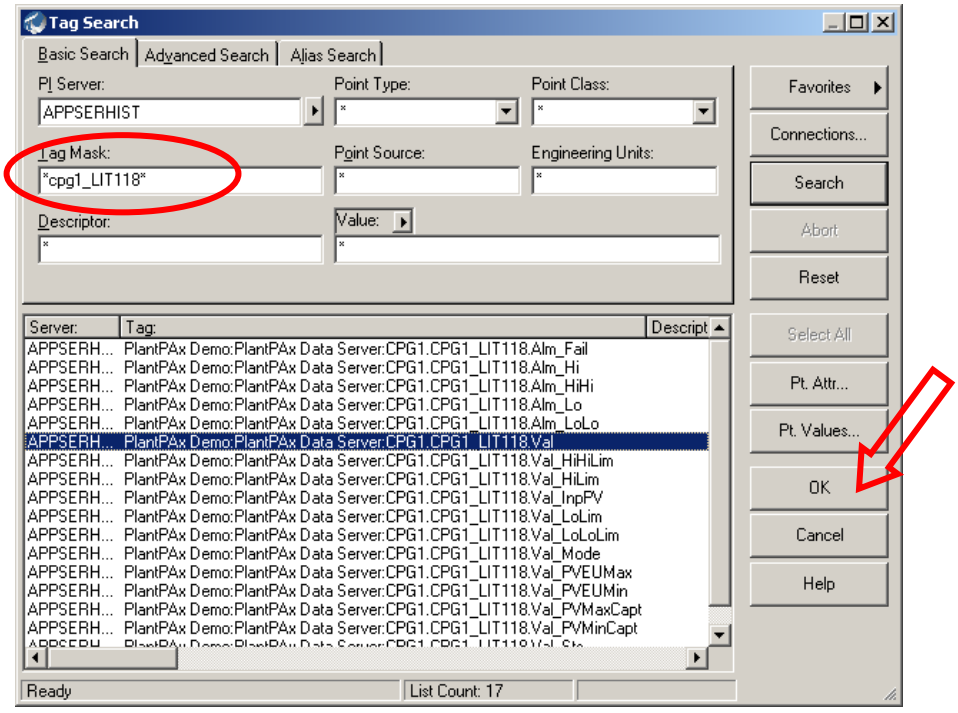


35. The Edit/View PIAlias Atributes window will appear, enter an ***Alias Name*** for our newly added tag. Call it ***RX_Level_PV***. If there were multiple PI Servers, you would select the appropriate **PI Server** from the pull-down option which is ***AppSerHist***.



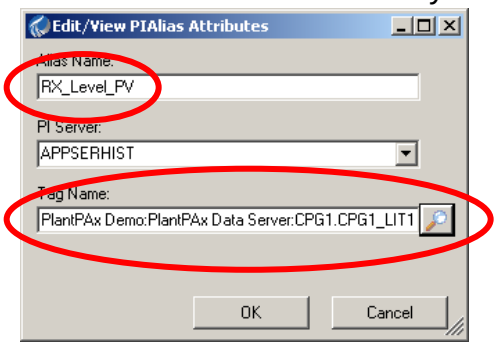
NOTE: The reason we have kept the alias name rather generic verses a more specific name like R01_Level_PV, or R02_Level_PV, is that the generic name will makes it easier to embed and use with the BatchView graphic with time-series historian data. If a BatchView graphic as built initially trends Reactor 01 with the RX_Level_PV in the time series graph, if the operator changes the unit to Reactor 02 during run-time, the time series trend change units level to the appropriate tag provided the same alias, RX_Level_PV, exists in Reactor 02. Operators might have a more difficulty if we used the more specific names for our aliases.

36. Select the **tag browser** icon, , to find the historian tag for level in Reactor 01, and later in Reactor 02. The tag names for these inputs were ***CPG1_LIT118.Val*** and ***CPG1_LIT218.Val,*** use this as part of the Tag Mask for the search.

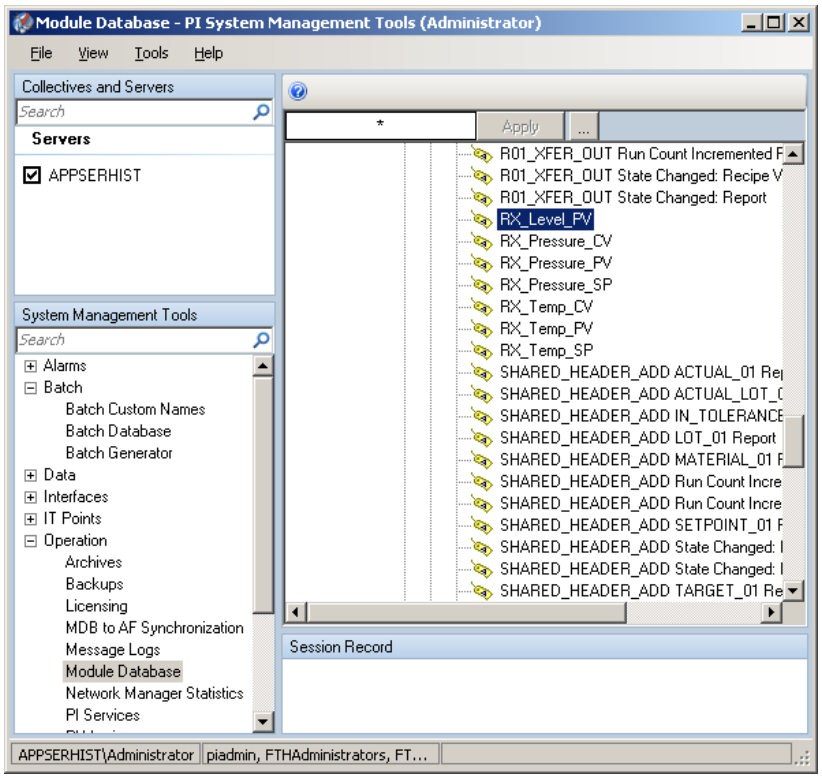


Select ***OK*** to link the historian data point for level tag, LIT118.Val, to the alias tag, RX_Level_PV within Reactor 01.

"Historian SE / Batch Analysis"

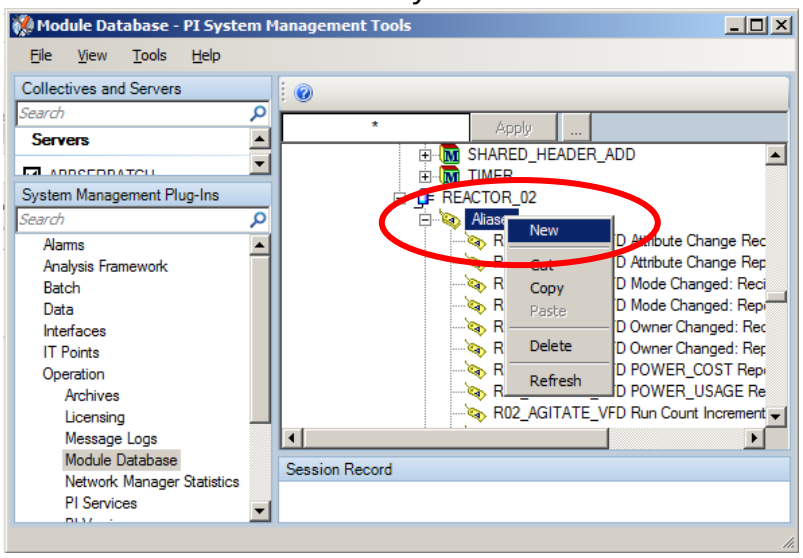


37. See that you now have the new alias for level in Reactor 01 alias folder called RX_Level_PV.

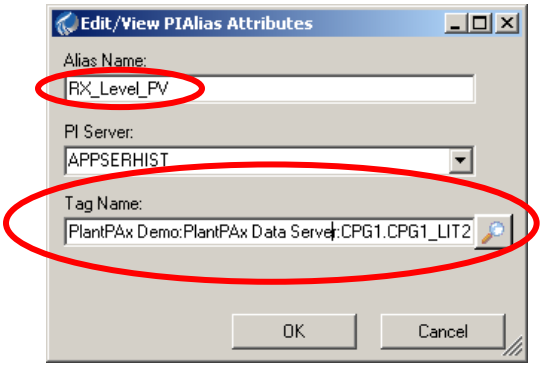


38. Repeat and create an alias level tag within Reactor 02 alias tag folder.

"Historian SE / Batch Analysis"



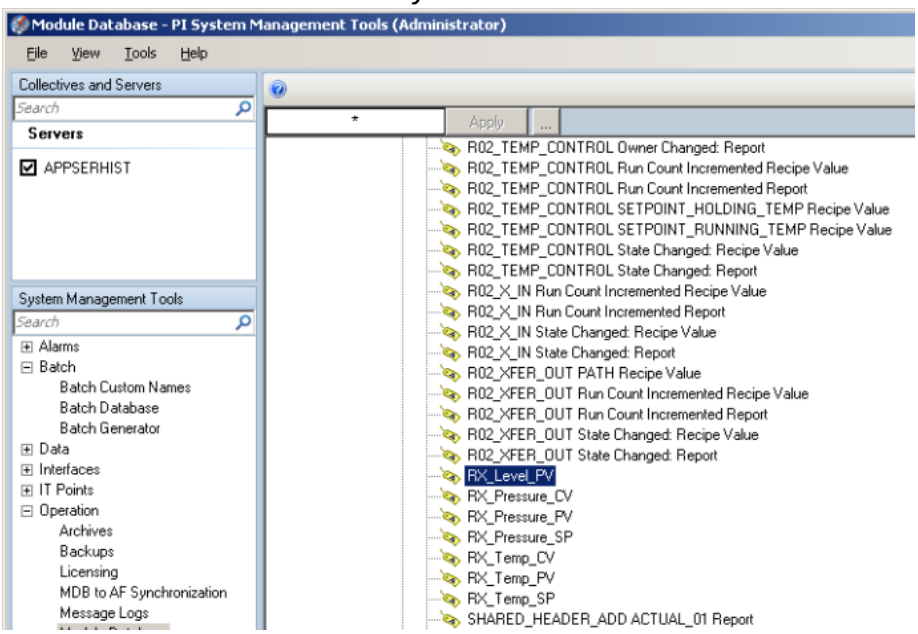
39. Fill in the appropriate data, and browse to select LIT218.Val for Reactor 02 much like you did for reactor 1 earlier.



> **NOTE:** From these screens we define all aliases we want to reference at a later date for analysis. Notice that this alias is looking at the LIT218.Val historian point..

40. ***Select OK***, verify that the new alias, RX_Level_PV, exists in Reactor 02 as well.

“Historian SE / Batch Analysis”



41. By creating these alias tags, we can use them in a Batch View trend so if we change units, the system knows which tag to associate on the trend with the unit selected. ***Minimize the SMT application***.

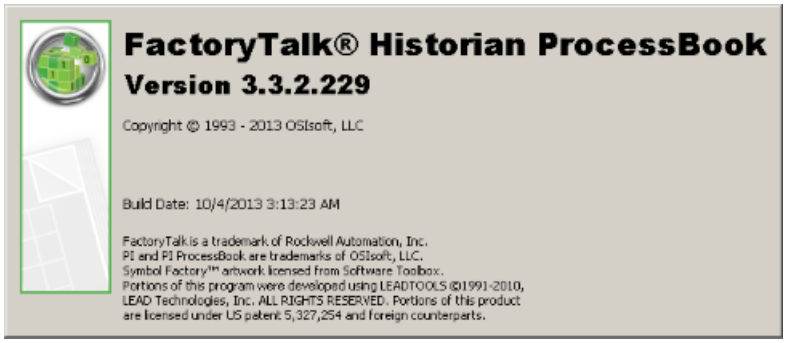
Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"
Section 4 – Engineer's perspective of ProcessBook with BatchView

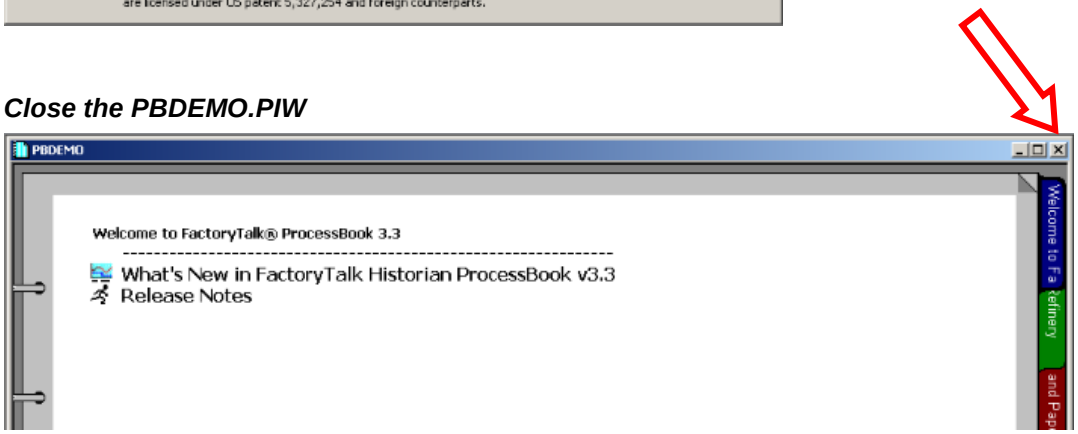
Here you will use Batch View for ProcessBook. Batch View will make it possible for batch-to-batch comparisons of completed or active batches. Comparisons against a golden or anchored batch become an everyday routine. Relative time comparisons can be made between batches as if they all started at the same time. Creating trends and leveraging the capabilities built into the tool is a powerful feature. We will examine several trends, and explore some of the capabilities of this tool.

Using ProcessBook is not usually something the operators will do, but for an engineer, this tool can be indispensible.

1. From the Start menu, ***select the FactoryTalk Historian ProcessBook*** to open.

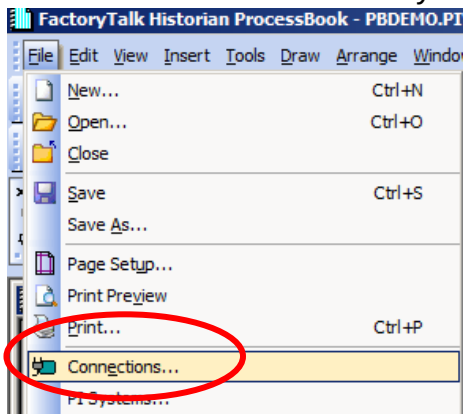


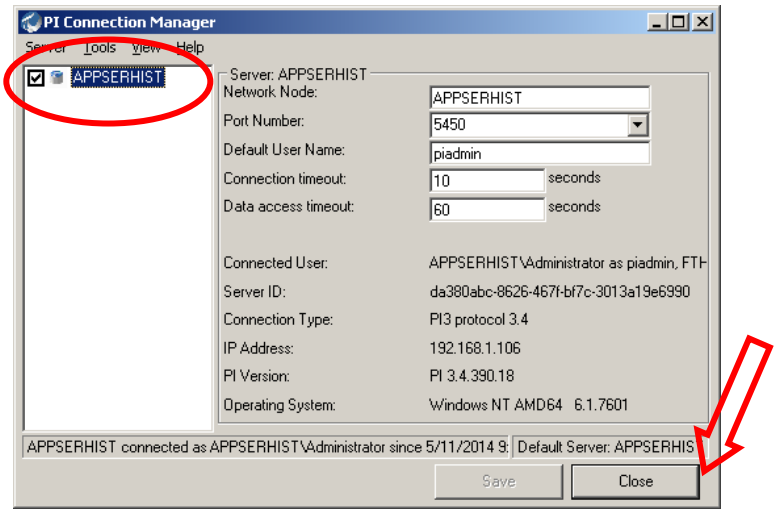
2. Close the PBDEMO.PIW



3. ***Select File>Connections*** to verify the Historian connection.

"Historian SE / Batch Analysis"

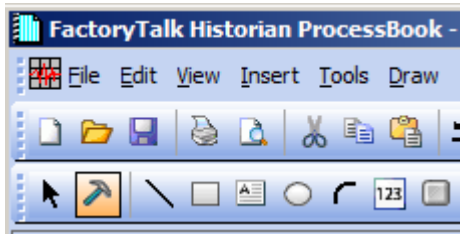




Close the Connection Manager window. You are connected to the correct historian server.

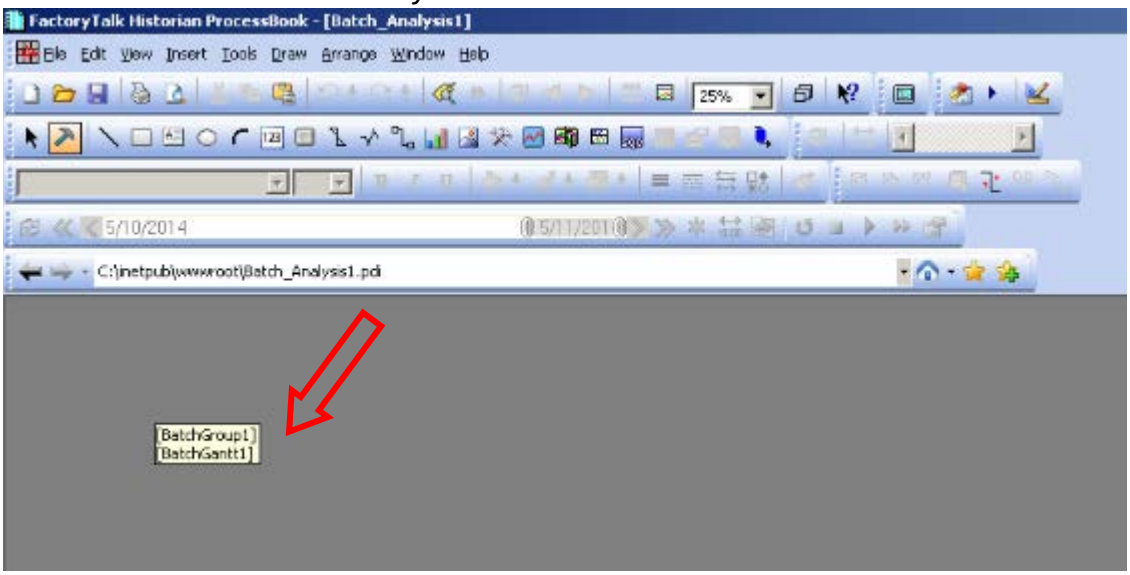
4. From the top menu ***select File>Open*** to select an existing Batch Group pdi file**,** browse to ***C:\inetpub\wwwroot\BatchAnalysis.***

5. When you open an existing file, you must change to the Build mode to edit. Otherwise, if building a new file, ignore as it should be in build mode already.

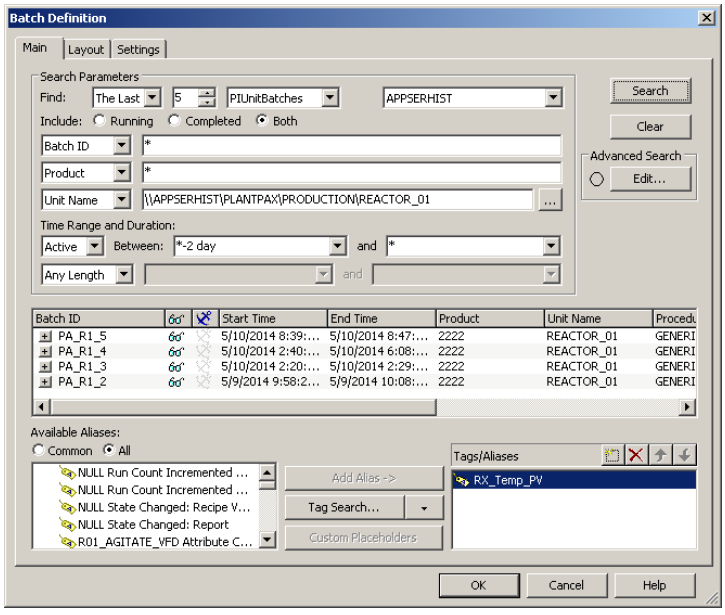


Select Build mode (hammer icon), and just double-click the Batch Group object in the work area for the Batch Definition window to appear. If you are in Run mode, double-clicking on the Batch Group object will only expand the object size. The Batch Definition window may look like this :

"Historian SE / Batch Analysis"



Double click anywhere on the (Batch Group1) [BatchGantt1] object area in the left upper corner area. When you do, a Batch Definition window pops up.

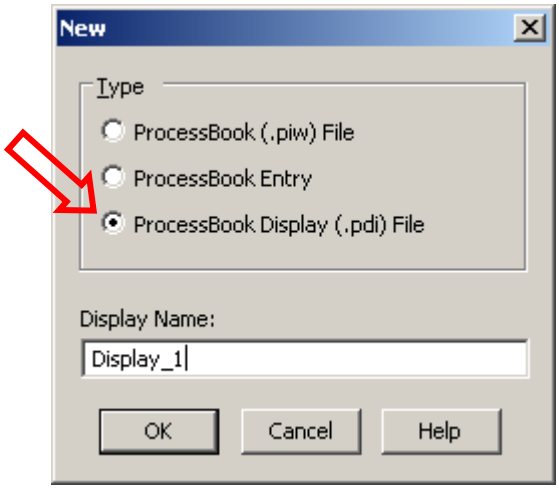


This Batch Definition window allows you to configure the entire look and feel of the graphic display for batch analysis with trending. For now, let's close this pdi file, and make our own. Select ***File Close.***

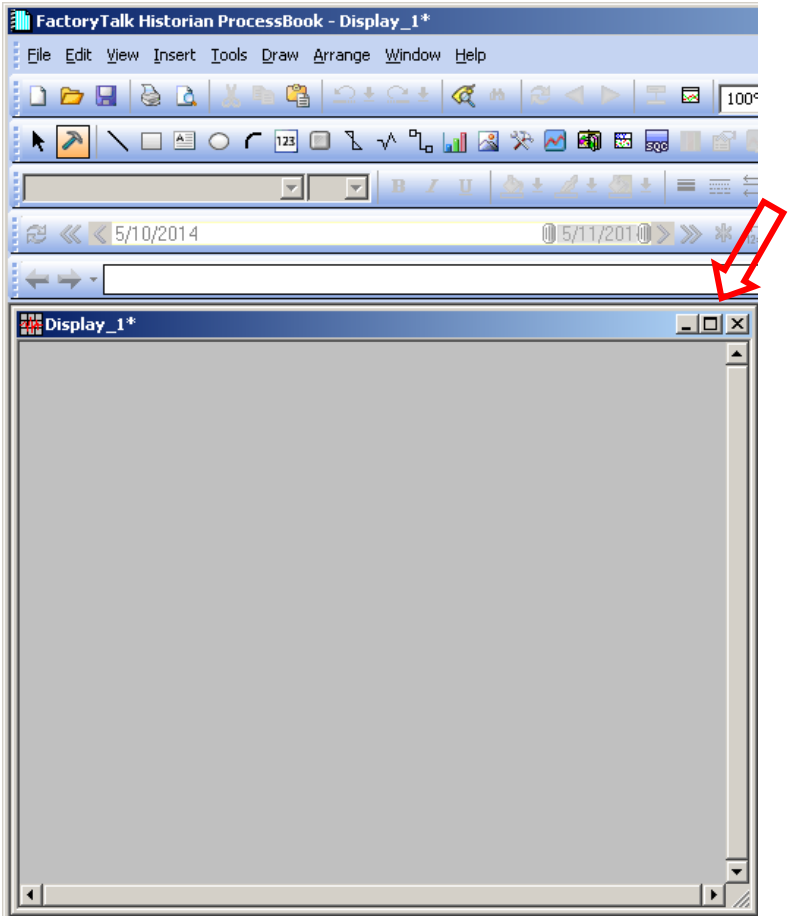
6. To create a new file, select ***Cancel*** on the Batch Definition window; we don't want to edit an existing pdi file. Select ***File>Close*** on the menu to remove the currently opened pdi file. Select ***File>New*** to

"Historian SE / Batch Analysis"

launch the New window popup. Here select the radio button for **ProcessBook Display(.pdi) file**. Enter a unique ***Display Name*** such as Display_1 as shown here:



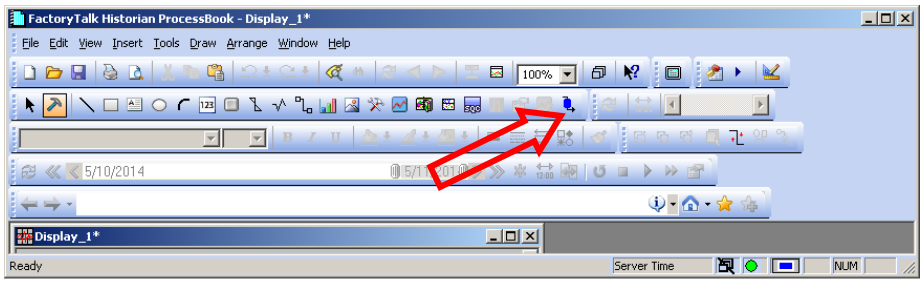
7. ***Select OK*** and open the Display_1 design window Full screen



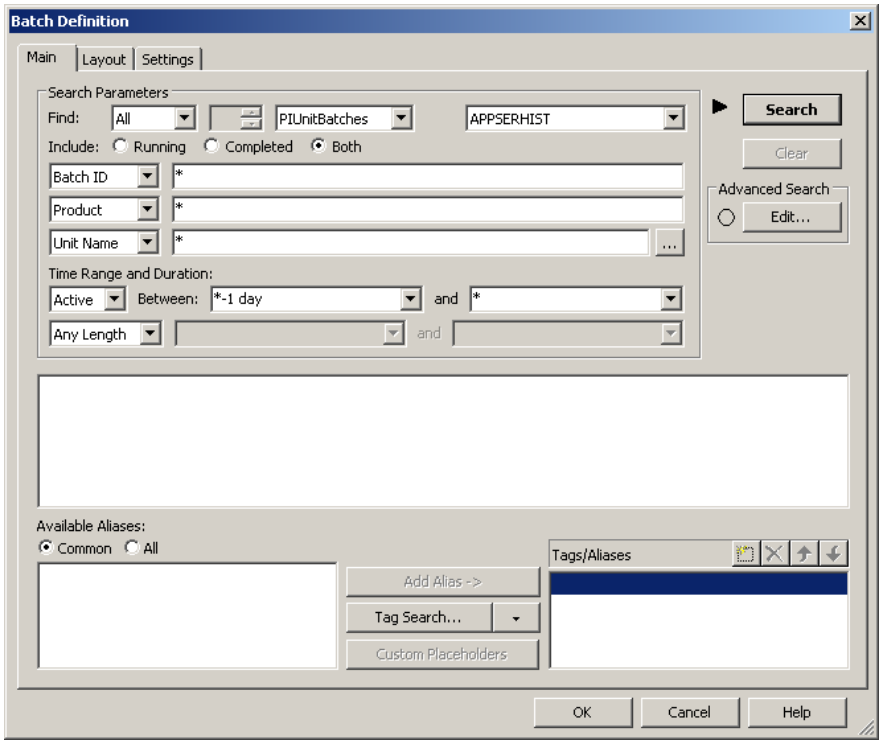
Lab 4: Factory Talk Batch

"Historian SE / Batch Analysis"

8. You will use the ***Batch Group*** icon, on the toolbar that exists within ProcessBook. ***Select the icon*** from the toolbar menu. Note: you must install the Batch View product for this to be available for use in ProcessBook.

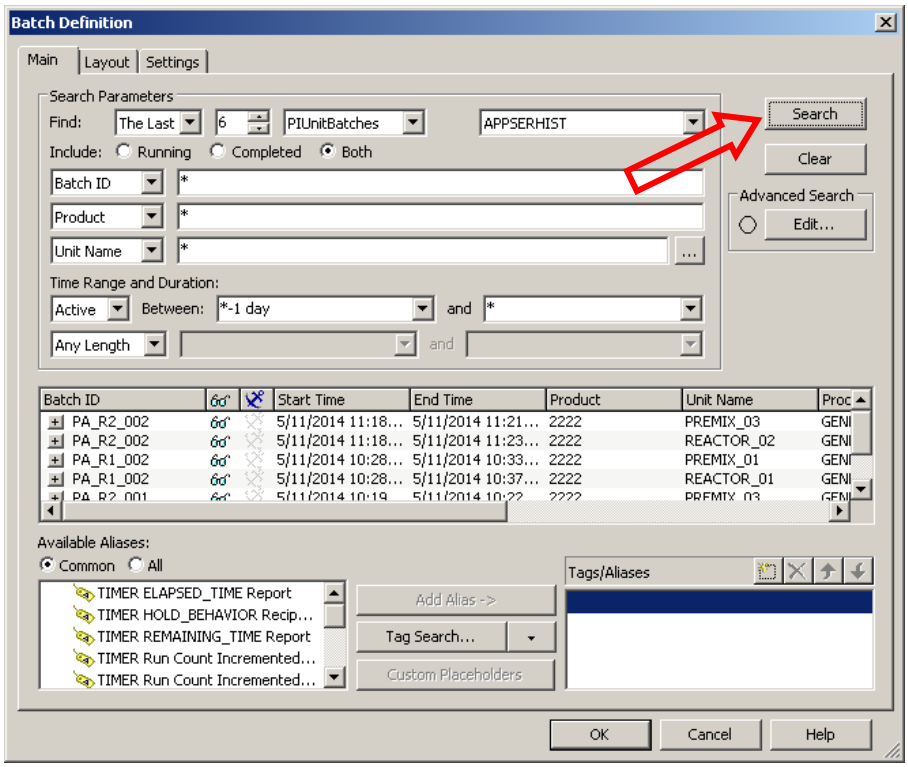


9. Once Batch Group is selected, place your mouse cursor in the ProcessBook work area, ***click and drag to make the Batch Group a decent size***. Be very careful not to drag the Batch Group too close to bottom of work area, the tool will expand the size greatly without you being aware that the work area is scrolling down for the coordinates. Upon release of your cursor it will plant the coordinates, and the Batch Definition window will appear. The size and the objects within the group can be manipulated and arranged according to your preference. This is the Batch Definition window that appears:



"Historian SE / Batch Analysis"

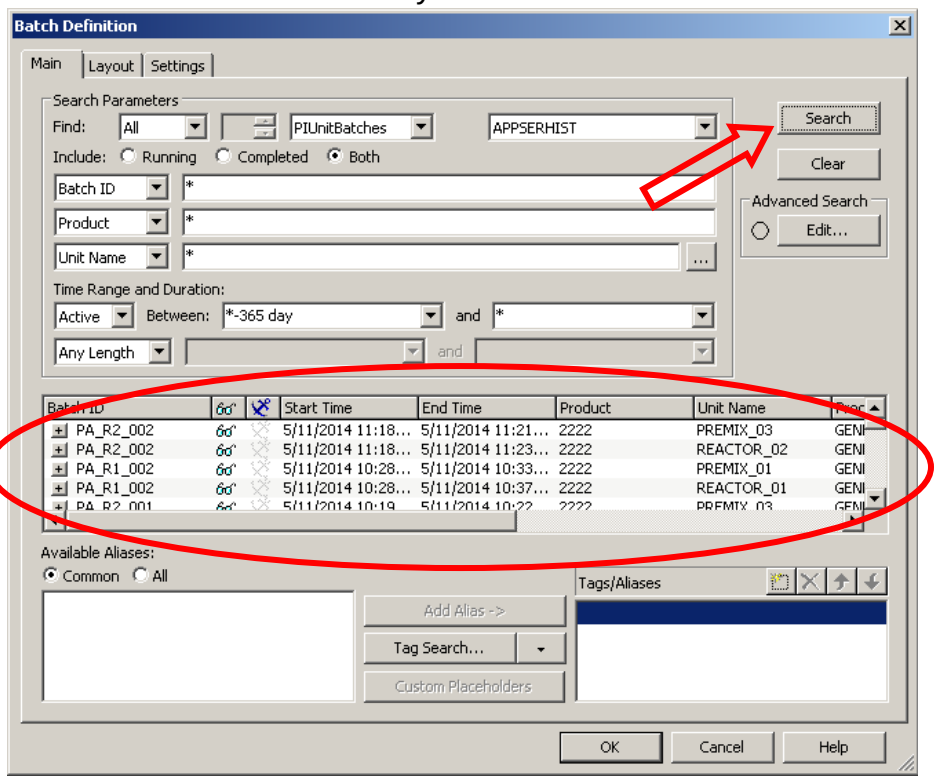
10. Within the Batch Definition window there is a definition area for the Search Parameters. This area provides extensive search options. Before our search we need to set the parameters for the search. Please change ***All*** to ***The Last*** which specifies the most recent batches. If you had selected "The First", it would infer the oldest batches to meet your criteria. Alll simply means every batch, and the number to search disappears. Please specify the last ***6*** batches. Following this is a drop-down menu for PIUnitBatches, or PIBatches where you should choose ***PIUnitBatches.*** Specify the Historian server as ***AppSerHist***. Notice the other criteria can be added via radio buttons - Running, Completed, or Both types of batches – please choose ***Both***. Running are any real-time batches that are currently being processed by the FactoryTalk Batch server. Next, there are three rows of filter criteria that can be used, ***BatchID, Product,*** and ***Unit Name***; the pull-down menu on each allows two other options - Unit Heading, and Procedure as well. Notice the Time Range and Duration options to specify for enhanced searching capabilities. ***Select Search,***



Use the scroll feature to move the list of batches up or down, how many batches are there from the search?

11. Try a search of Active Batches for the last year ****-365 days***, and Find: ***All***. Select the ***Search*** button to see what batches show up in the list. Notice there are some from 2013 when batches were run on this image. Feel free to use this data later if you have time to explore deeper with these tools for analysis and comparison of batches.

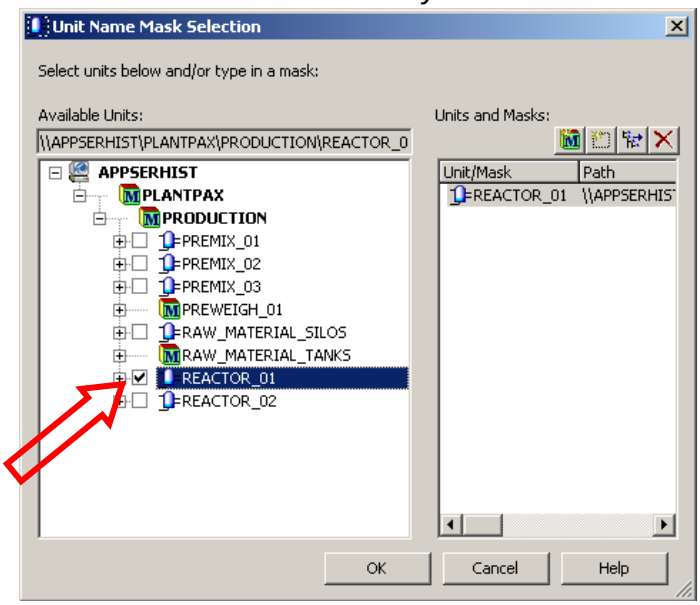
“Historian SE / Batch Analysis”



12. Data is usually tied to ***PIUnitBatches*** to analyze for a specific unit. To do this, please select the ***Unit Name*** browse button icon, , or type in *Reactor_01*, or *Reactor_02*,

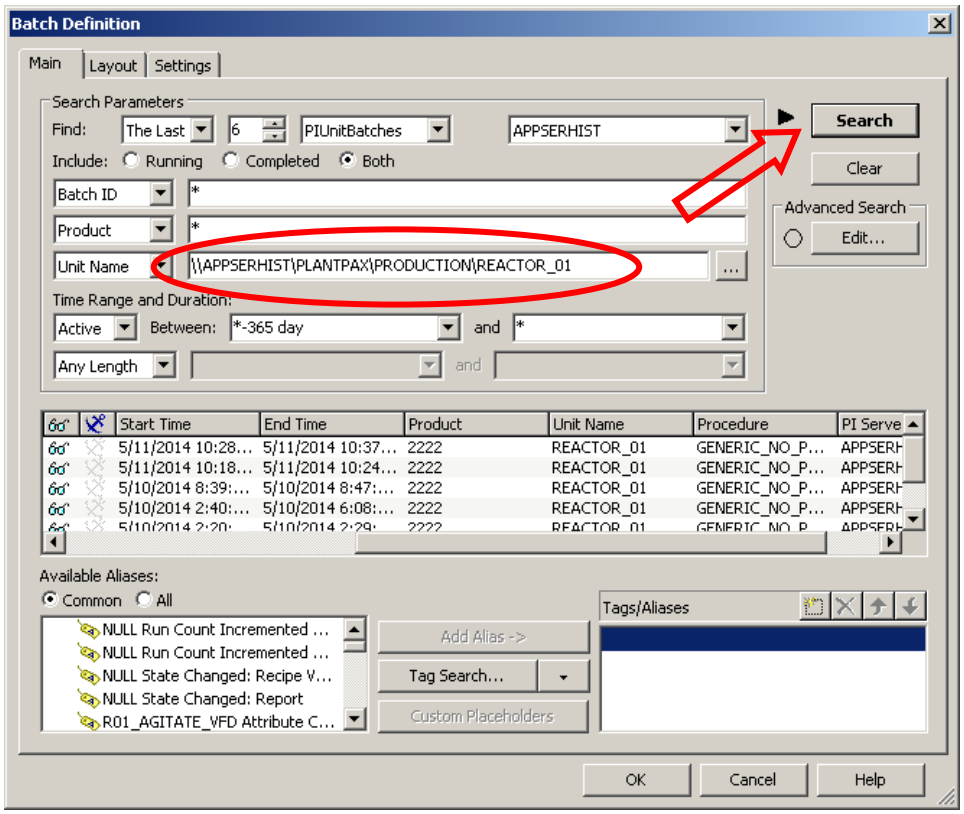
    If you select the Unit Name browse button, , expand the equipment tree, and ***check the box to the left of Reactor_01*** as seen below:

"Historian SE / Batch Analysis"



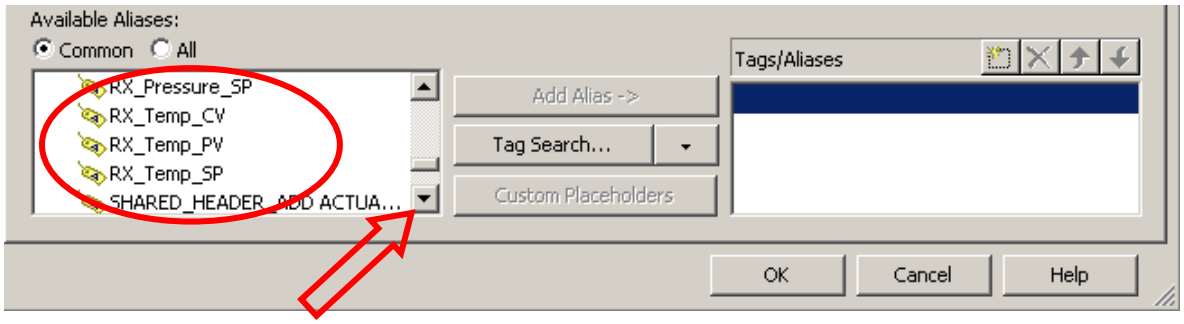
Once you do this, the Reactor_01 unit is placed into the Units and Masks column at the right.

13. ***Select OK*** to go back to the Batch Definition window. Next, select ***Search*** again to find the batches.

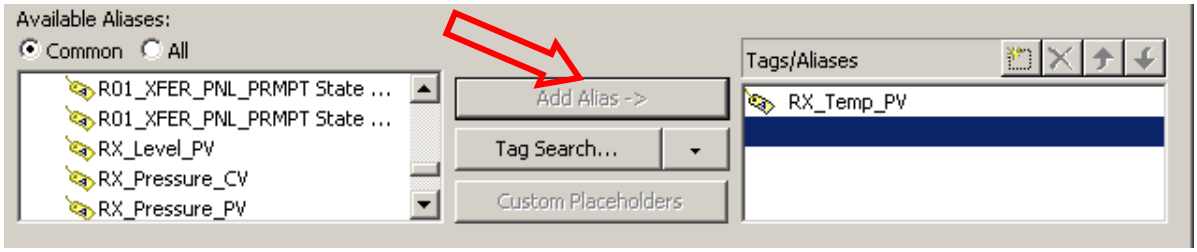


"Historian SE / Batch Analysis"

14. Within the Batch Definition window, you may select the Tag Search button. This will help you list the historian tags of interest to add to the trend analysis within the Batch Group from anywhere. All phase tags are defined as string by default due to definition within the Batch Event Interface INI file. Therefore, to trend time-series data, you must use something other than string data. Therefore, the alias tags for level, pressure and temperature assigned in the reactor units give us such trend capabilities. You can choose from these aliases to add to the Batch Group for time-series trending. If you notice, those aliases don't require you to use the Tag Search, they are listed on the bottom left of the Batch Definition window. Scroll down the list of Aliases until you find those starting with RX_



15. For the Alias tags in the Batch Group, select the tag of interest on the left then select the **Add Alias->** button to add it as a time-series trend tag on the right. Please try this for **RX_Temp_PV**.

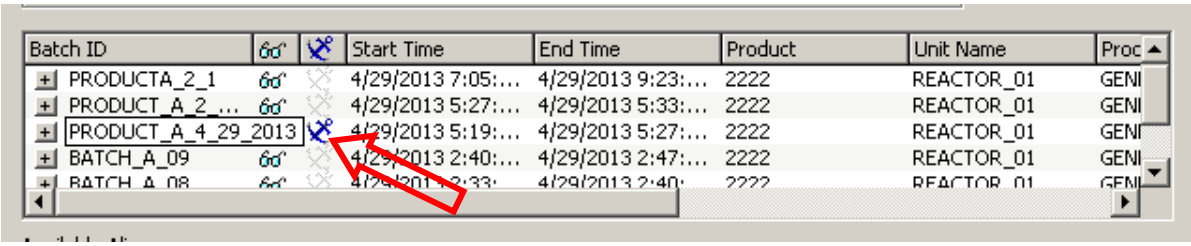


NOTE: RX_Temp_PV is tied to the historian tag for the Reactor Temperature. By defining this as the alias for both, Reactor 01 and Reactor 02 temperature PVs, it allows you to switch the unit for the BatchView during run-time without creating an invalid trend where Reactor 02 batch data might be compared with the wrong reactor's temperature. The properly associated time-series temperature PV tag will be applied to the trend for the appropriate reactor defined for the trend.

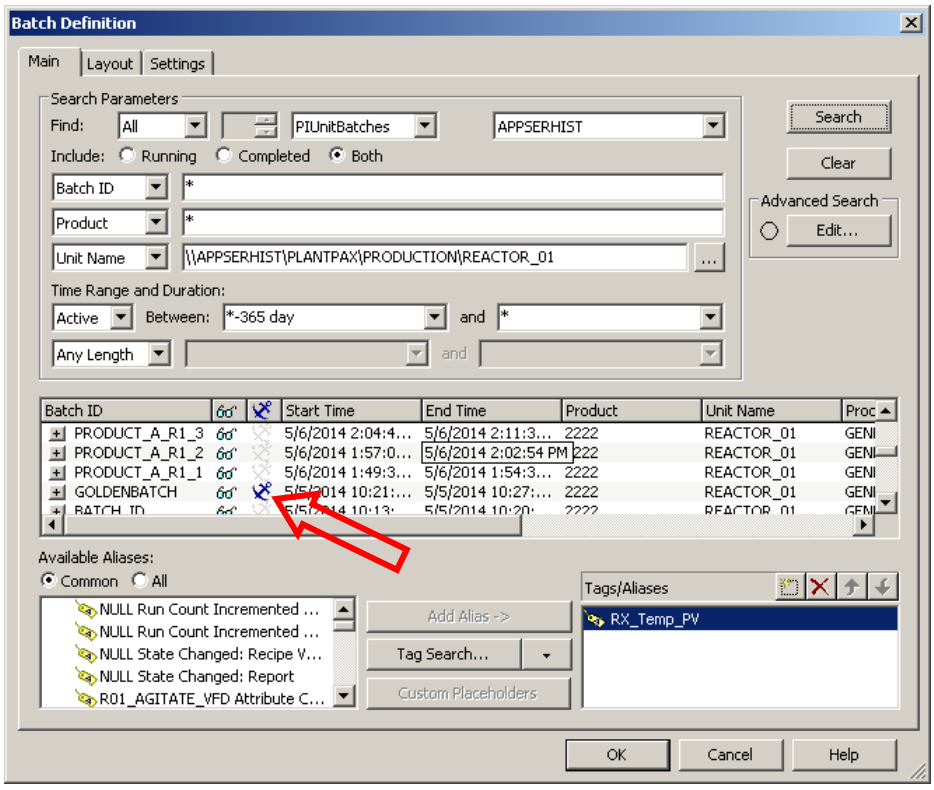
16. Another option that you have within the Batch Definition window is to anchor a batch to the Batch Group. Therefore, if the operator changes the search criteria to bring up other batches, the anchored batch will always remain. Often times, this is a valuable practice for what many would describe as a golden batch. The golden batch is considered by some to be the batch that operators aspire all their batches to emulate. By anchoring a golden batch in the group, it helps operators and engineers

"Historian SE / Batch Analysis"

make comparisons to understand characteristics and results of the other batches in relationship to one that was considered to be spectacular. To anchor a batch in the definition window, use the search criteria to find your golden batch, then select the anchor box in its row. It will be anchored like the middle batch shown here with blue anchor after selecting it with the cursor and mouse click.



Let's try it for one of your batches in the list. Make sure that Find: is set to ***All,*** and span ****-365 days***, ***select Search***, then scroll down through the Batch IDs to find "GOLDENBATCH", select the anchor on it,



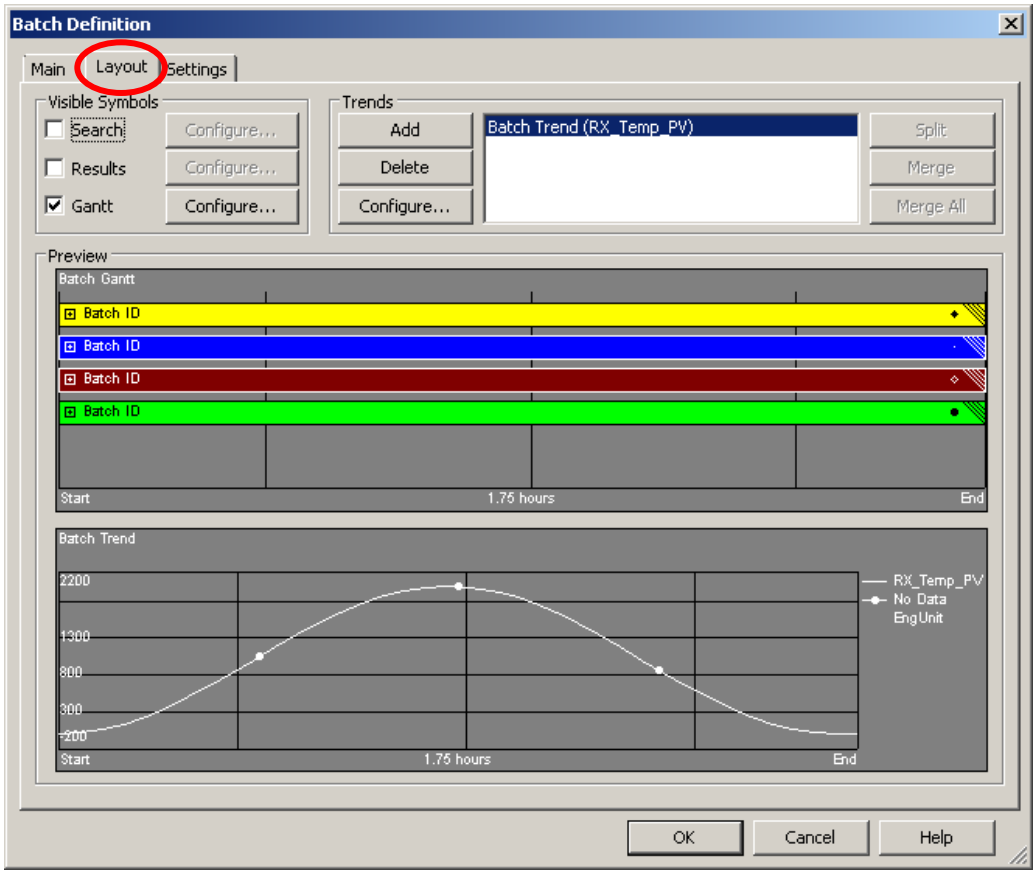
Now, change Find: to ***The Last***, and ***6*** PI UnitBatches, between *-365 day and *, ***select Search***

Notice this older GOLDENBATCH is grouped with the 6 newest recipes for Reactor 01.

17. From the Batch Definition window you can select the ***Layout*** for your Batch Group. There are 4 possible components to make visible in the group. This includes: a Search pane, a Result pane, a Gantt pane and a time-series Trend pane. Each of these is a separate object in the work area within

"Historian SE / Batch Analysis"

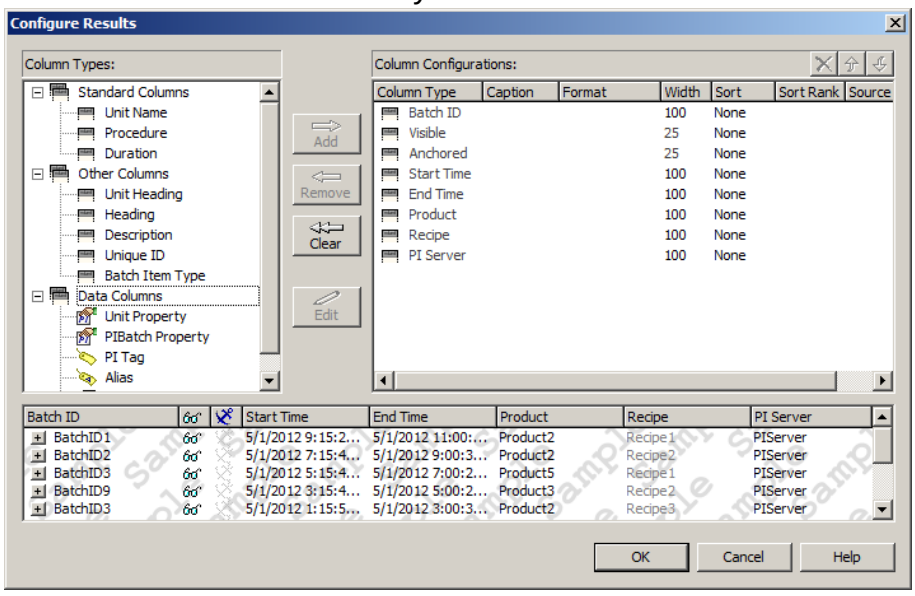
ProcessBook, each with its own configuration for display.



NOTE: The search pane may not be necessary; you can always right-mouse click the object to get the search option at any time.

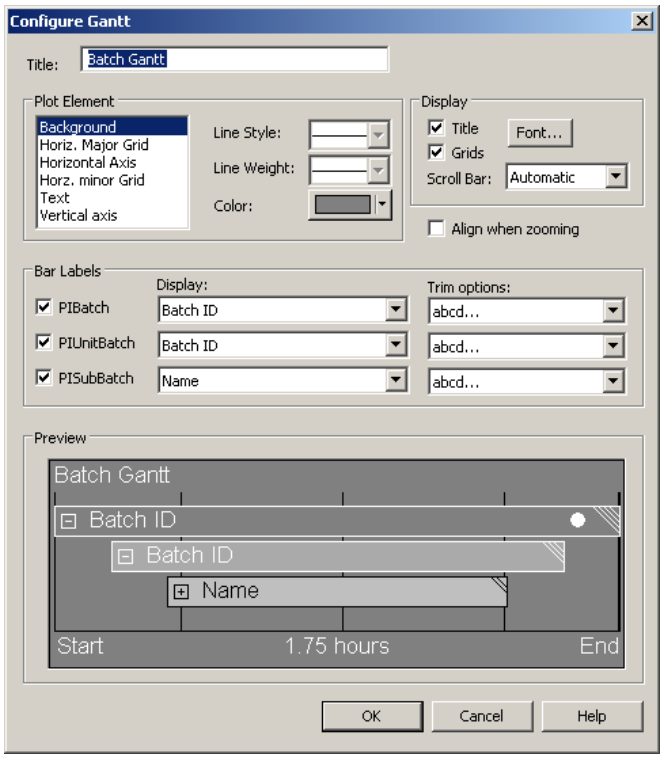
18. Select the ***Results*** check box, select the ***Configure*** button. Here you can modify what columns of data to be included in the batch results pane. There is limited space so it may not be helpful to choose everything. Try different arrangements of column data.

"Historian SE / Batch Analysis"



Select ***Cancel*** if you wish to void any changes.

19. Select ***Configure*** next to the ***Gantt*** option to display the Gantt Configuration window:

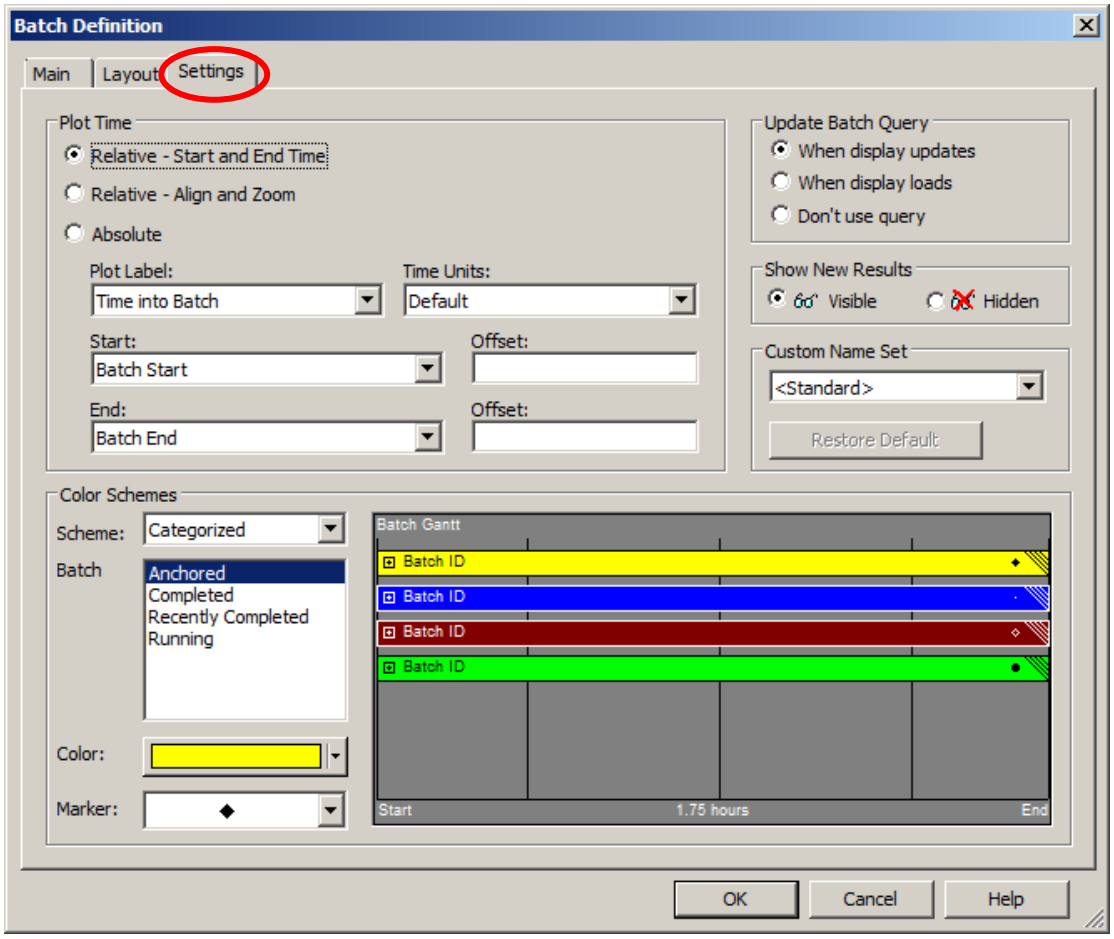


The best way to learn what you like for these settings is simply by trial and error – just do it!

20. The ***Settings*** tab allows you more options to customize the look and feel of your Batch Group. You can plot time as relative or absolute. Colors schemes for your Gantt chart batches to easily identify

"Historian SE / Batch Analysis"

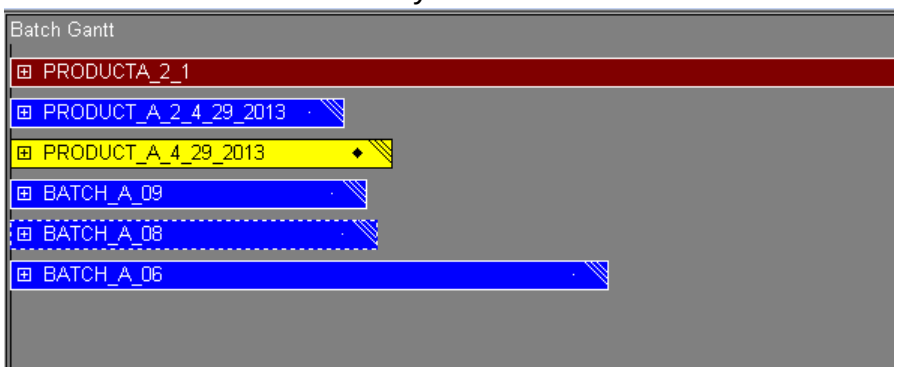
some key properties of your batches.



21. Select ***OK*** on the Batch Definition window. This will take you into the work area of ProcessBook. You can move each object that makes up your Batch Group around, and resize them to completely customize your design. Learning how to size everything may be difficult at first so I don't suggest it in this lab.

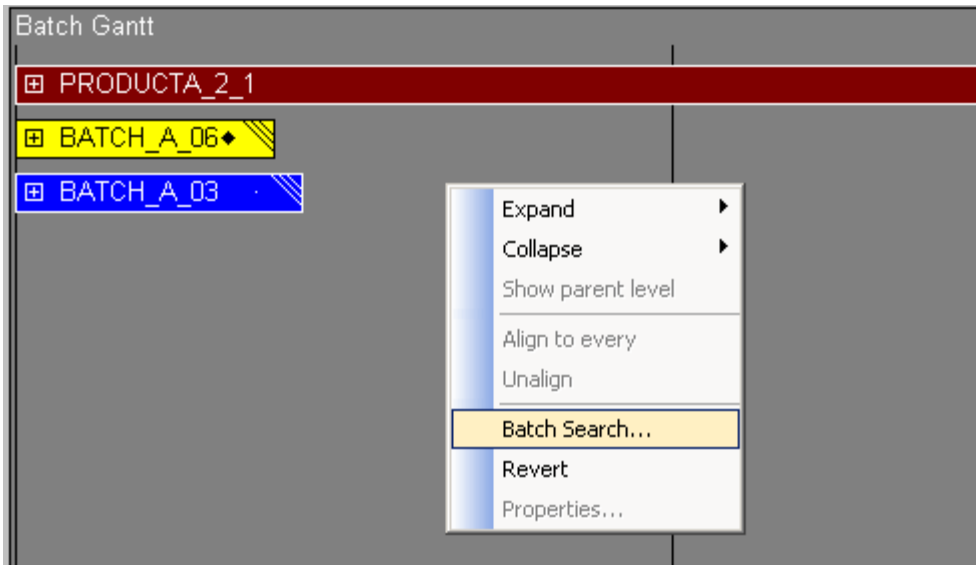
22. ***Switch*** the Batch Group from ***Build mode,*** into ***Run mode***, . Select on the various objects to get a feel for using them and seeing their data. Select your batches in the Result pane to see how the trend highlights for each selection. Notice the yellow colored batch is your Golden Batch, - the one you had pinned.

"Historian SE / Batch Analysis"



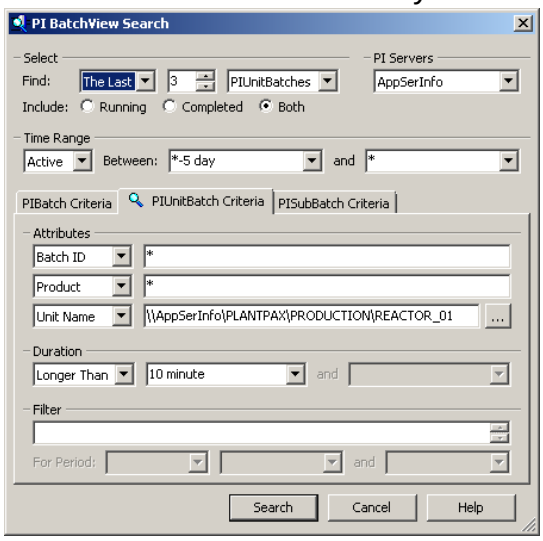
23. We will expand a batch in the Gantt chart to observe time, and phase execution. Observe the phase execution. If you can't read the expanded phases, you may need to alter your time span for the graph. For this chart, we would not able to view the expanded phases in the yellow and blue batch. The long red batch is extending the time span of our x-axis, thus compressing the other batches of interest space within the display.

24. While in the run mode, if you right mouse click the Gantt chart, select ***Batch Search…***

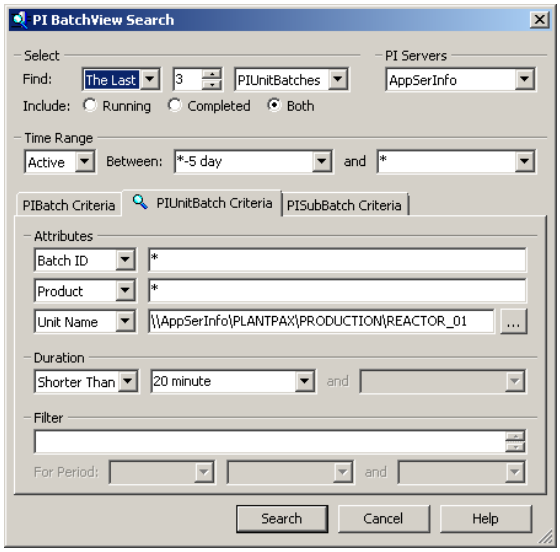


25. Modify the batch time criteria under ***DURATION*** to allow this to apply a shorter time span of batches.

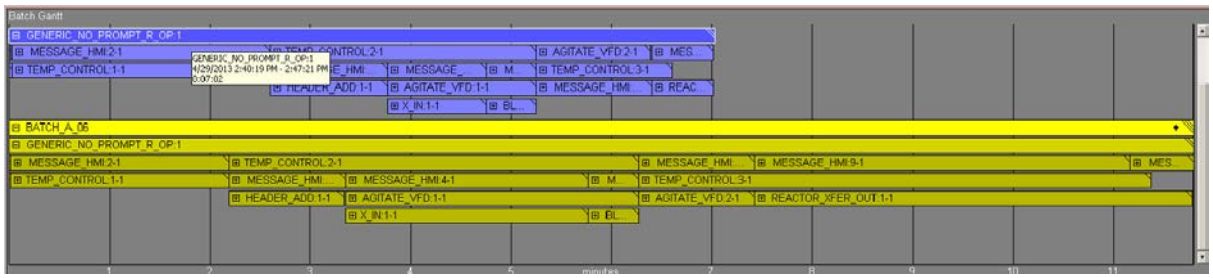
"Historian SE / Batch Analysis"



Change this to ***Less Than*** 20 or 15 minute



26. Select ***Search.*** Expand the results. Notice how the shorter batches take up a larger percentage of the graph due to this duration time change:

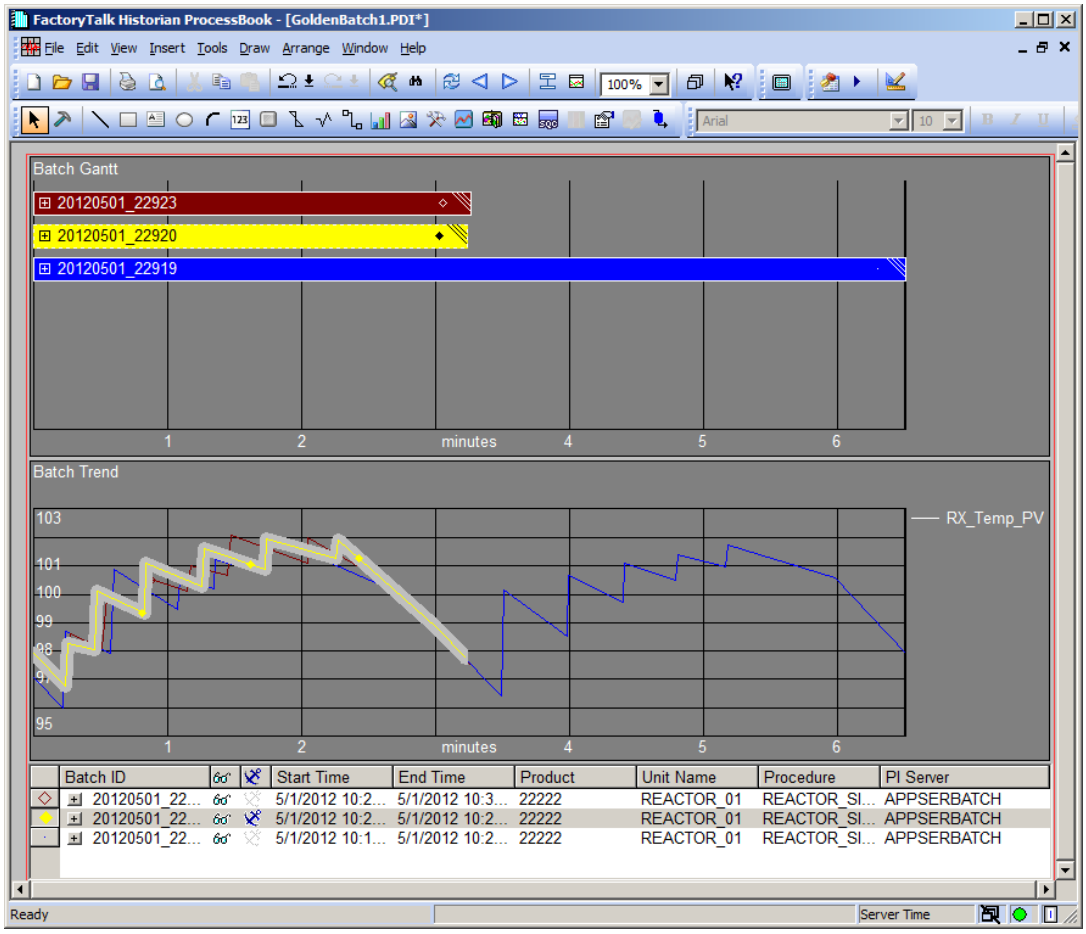


27. Once finished, ***Close*** this pdi file.

"Historian SE / Batch Analysis"

28. Open the GoldenBatch1.pdi file. You will be adjusting different settings such as the number of batches to change what is displayed and observed in Run mode.

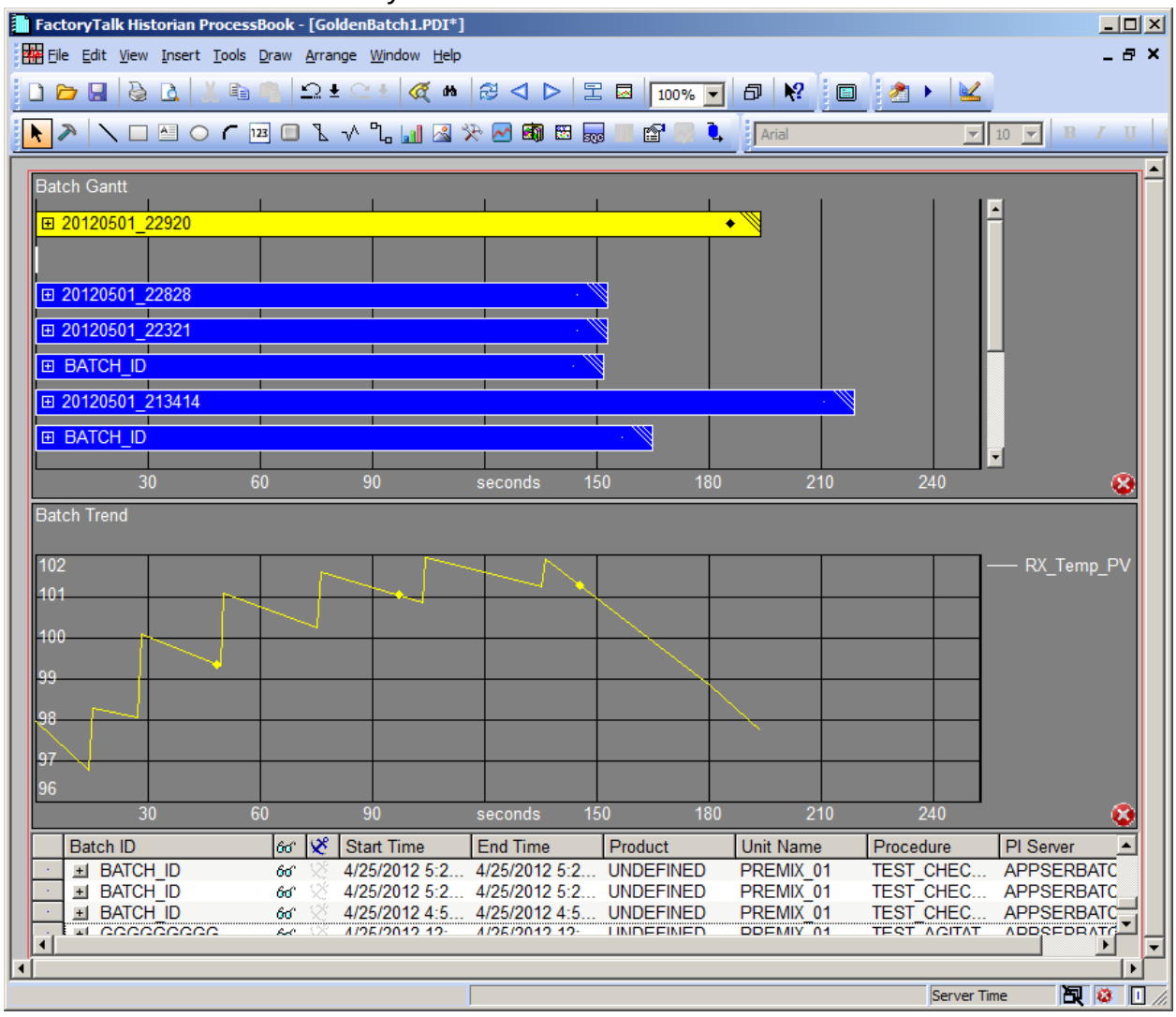
    Make sure this graphic is in Run mode,



29. Now, while in the Run mode, right-mouse click on your Batch Group objects to see your dynamic options to change data within the Batch Group during Run mode. With the right-mouse click Search option you can change the data that is being displayed. Try the Search option, and change from the unit Reactor_01 to Premix_01

    Try changing tag trend analysis using RX_Level_PV and RX_Pressure_PV instead of reactor temperature.

“Historian SE / Batch Analysis”



Here the unit was changed to Premix 01, and the duration shortened to less than 5 minutes, and the number of batches increased to 6. Take time to try different features and ask lab assistant questions if you have any.

Lab 5: Logix Batch & Sequence Manager

Lab5: Logix Batch & Sequence Manager

Setup

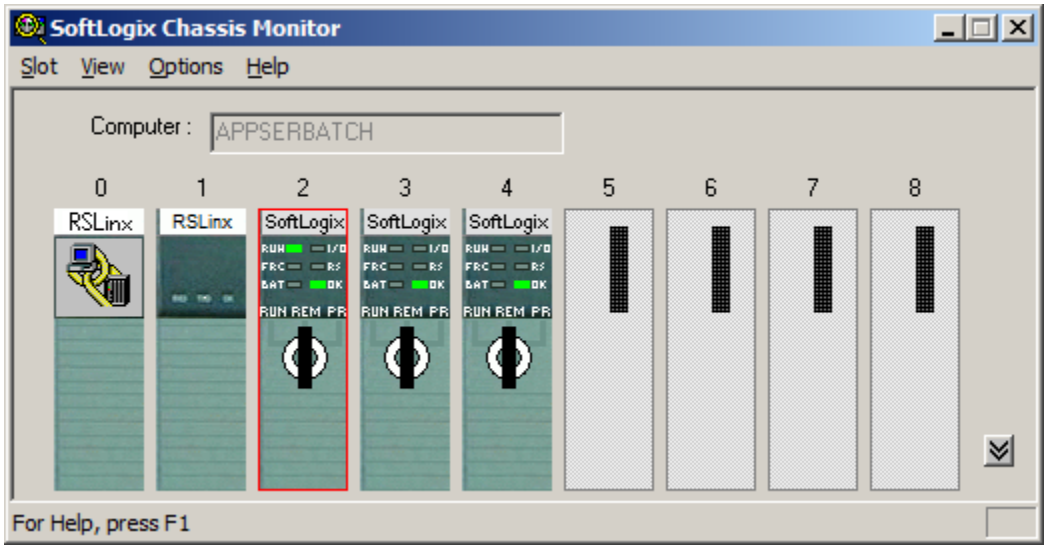
Start the software and open a project

SoftLogix Setup

The SoftLogix, RSLogix 5000 and FactoryTalk ViewSE programs should all be running and you can go straight to the *Operator's Perspective* section. If the programs are not running the steps below describe how to start the project.

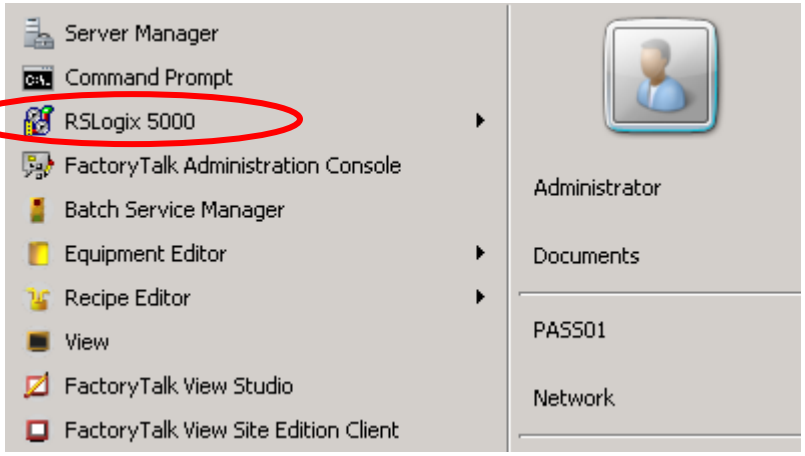
1. ***SoftLogix*** will start with the start of Windows Server 2008, look for its icon in the system tray in the lower right of the screen.

2. Wait a minute or two for SoftLogix to initialize, if the image has just been started.

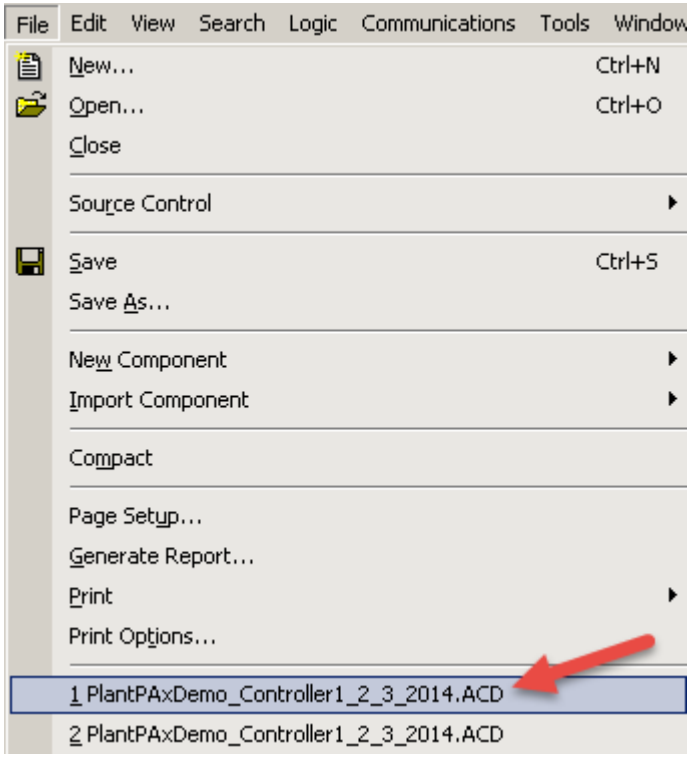


Controller Setup

3. From the start bar, open RSLogix5000, ***Start > RSLogix 5000***.



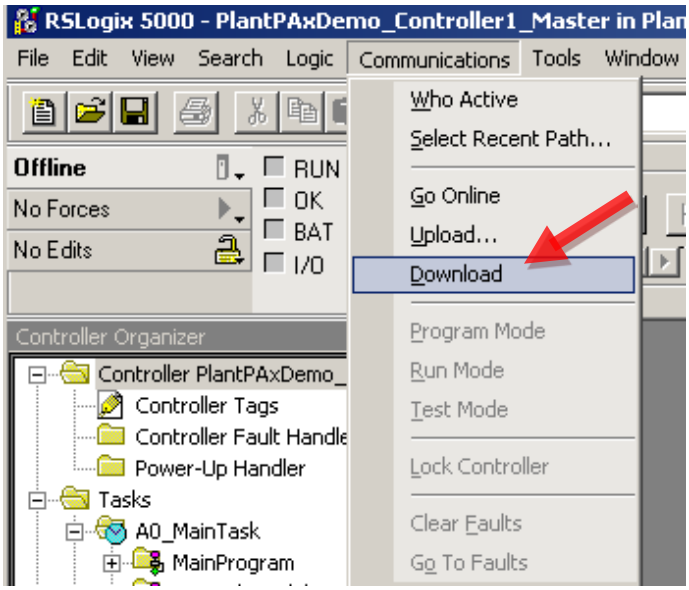
4. Select ***PlantPAxDemo_Controller1_2_3_2014.ACD*** control file from ***File*** menu under the recent open listings, or use ***File>Open*** menu and browse to "***C:\PlantPAx Demo\CLX\PlantPAx Demo Processor ACD Files"*** selecting the ***PlantPAxDemo_Controller1_2_3_2014.ACD*** file.



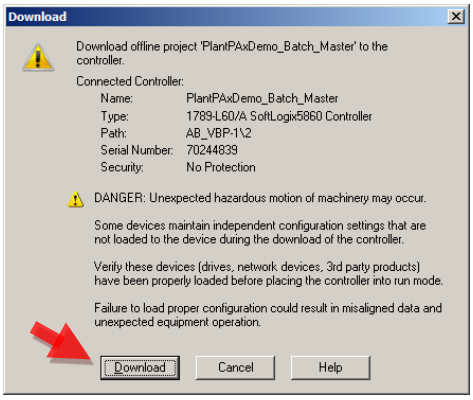
Please verify that you opened the correct ACD file. Observe the RSLogix 5000 title bar to verify that the proper file was opened as shown:

Note: If the wrong file is opened and downloaded in the next step, an error will occur.

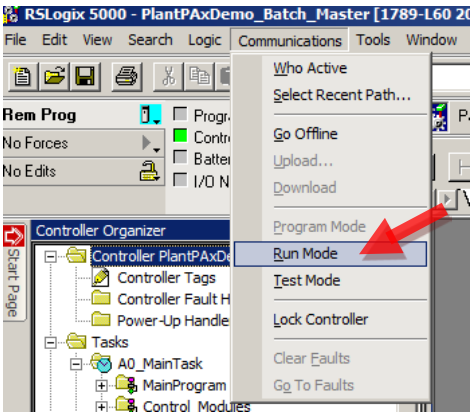
5. From the communications menu, select ***Communications > Download***.



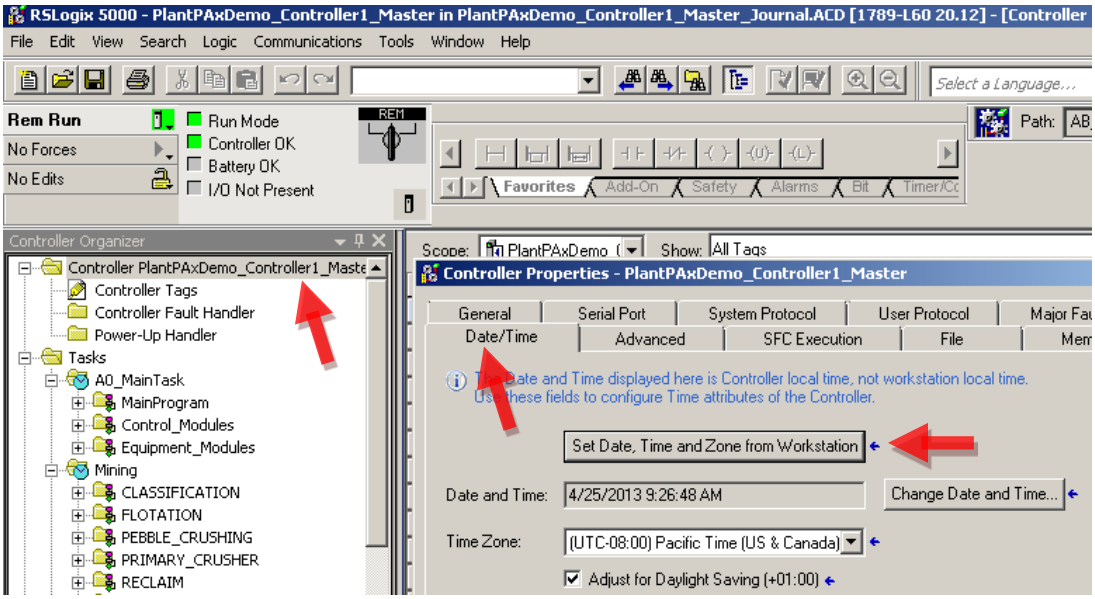
6. Select ***Download***



7. From the communications menu, select ***Run Mode***.



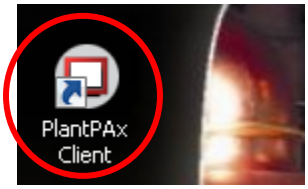
8. Check that the controller has the correct time by right-clicking on the controller name to bring up its properties pages, select the "***Date/Time***" tag and select '***Set Date, Time and Zone from Workstation***" if the controller time is incorrect.

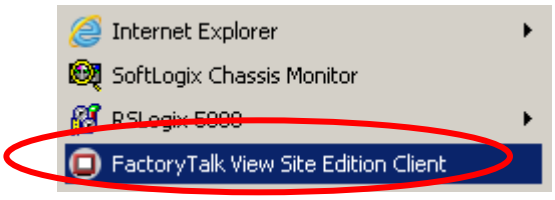


9. ***Minimize*** RSLogix5000.

HMI Setup - Client

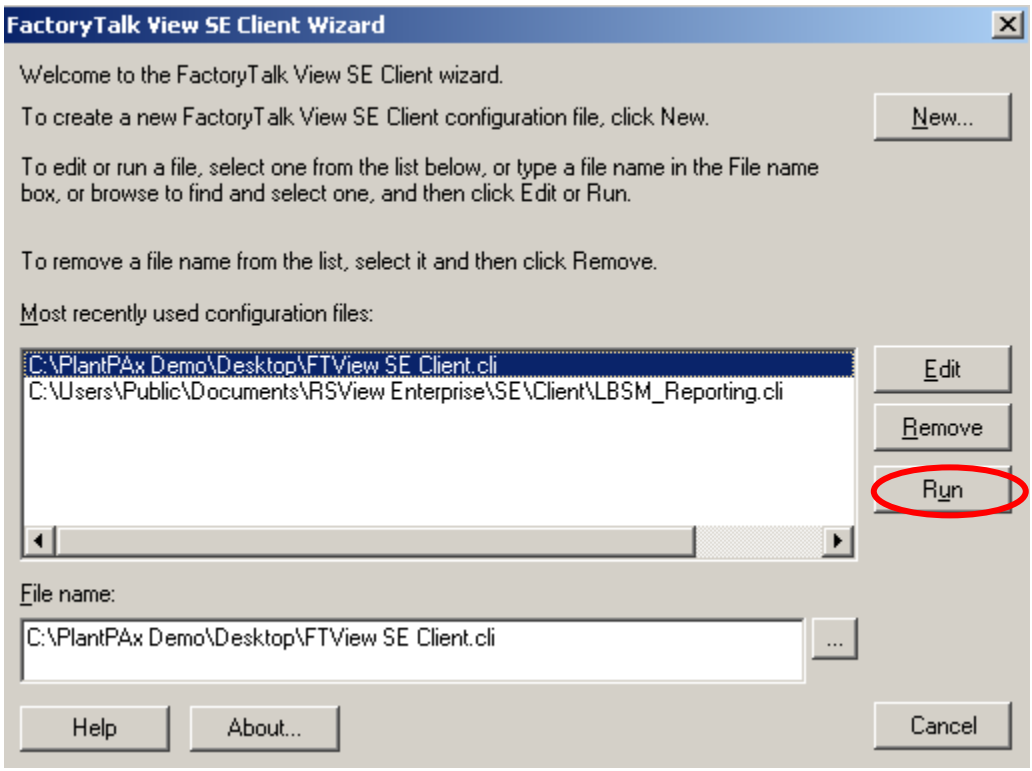
10. From the Desktop select the "***PlantPAx Client***" icon or from the start menu select ***Start > FactoryTalk View Site Edition Client*** and complete step 10 and 11.





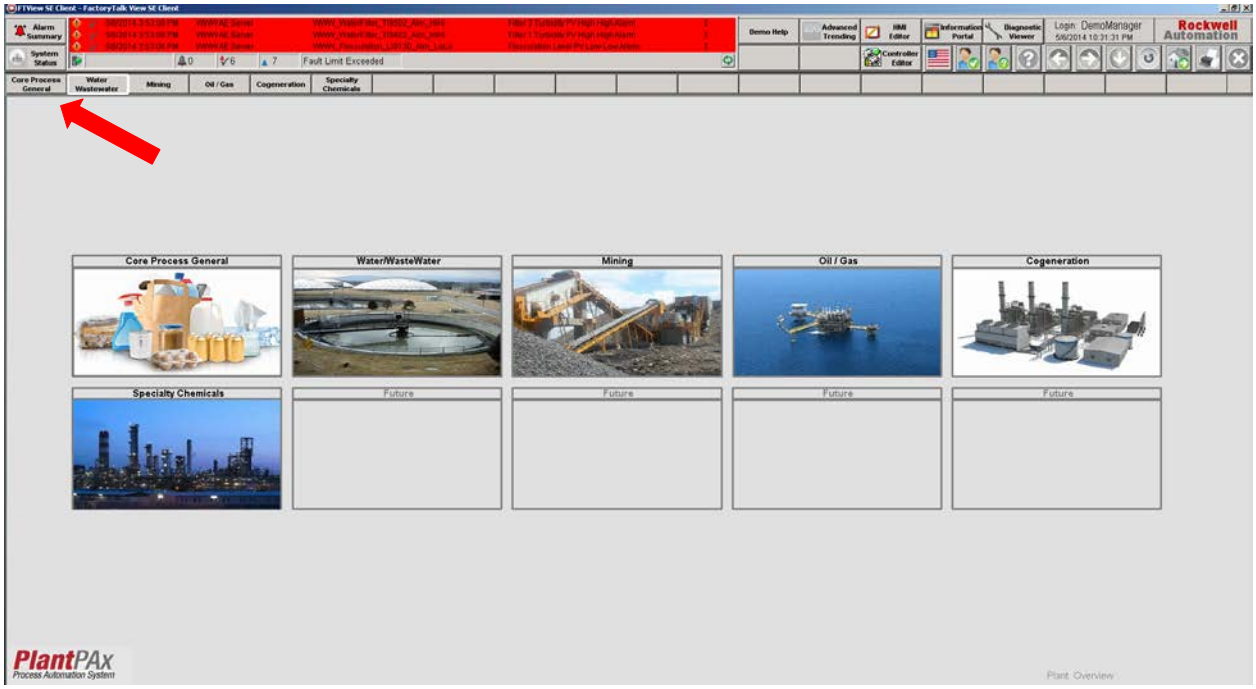
11. In the **FactoryTalk View SE Client Wizard** dialog select the "***FTView SE Client.cli"*** client file in the most recently used configuration files window.

12. Press the ***Run*** button.

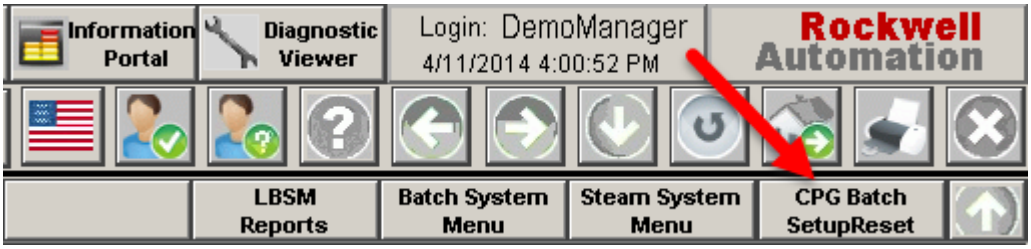


Enable LBSM

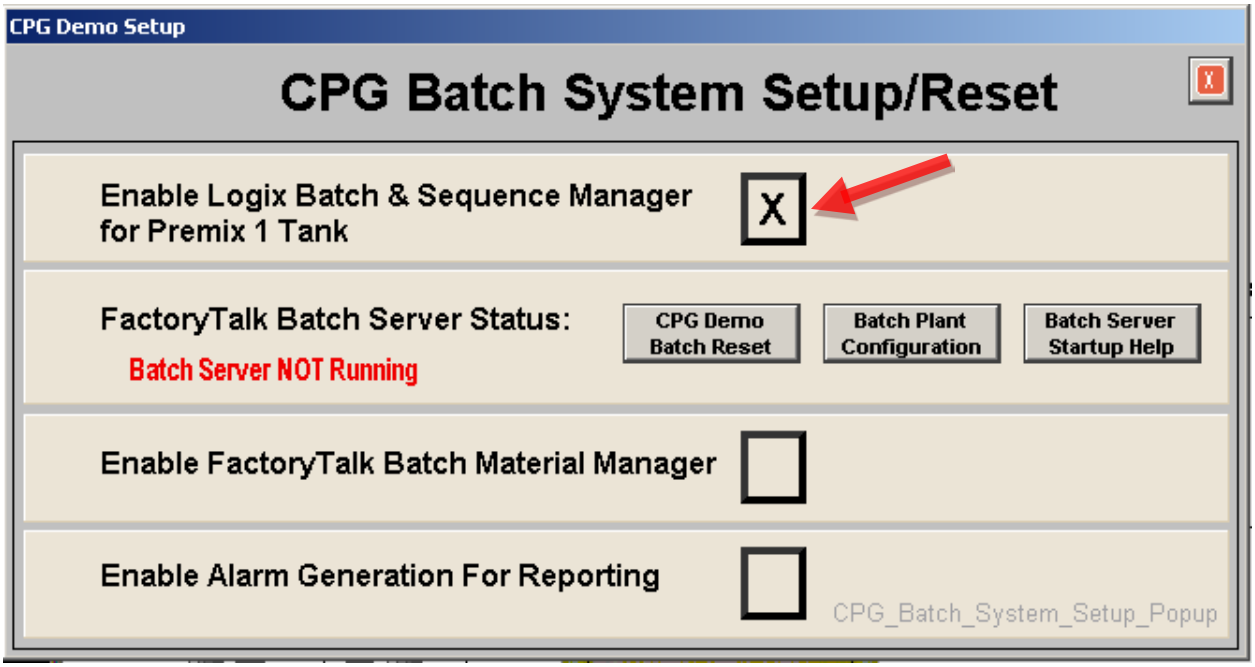
13. When the HMI client opens, maximize the screen and select the "**Core Process General**" button which will open the "**Process Overview**" display.



14. On the "**Process Overview**" display select the "***CPG Batch SetupReset***" button.



15. Click on the box "***Enable Logix Batch & Sequence Manager for Premix 1 Tank***" *and uncheck* "***Enable FactoryTalk Batch Material Manager***", *then* Click "***Close***". The FactoryTalk Batch Server should not be running as shown below.



16. Setup is now complete.

Operator's Perspective

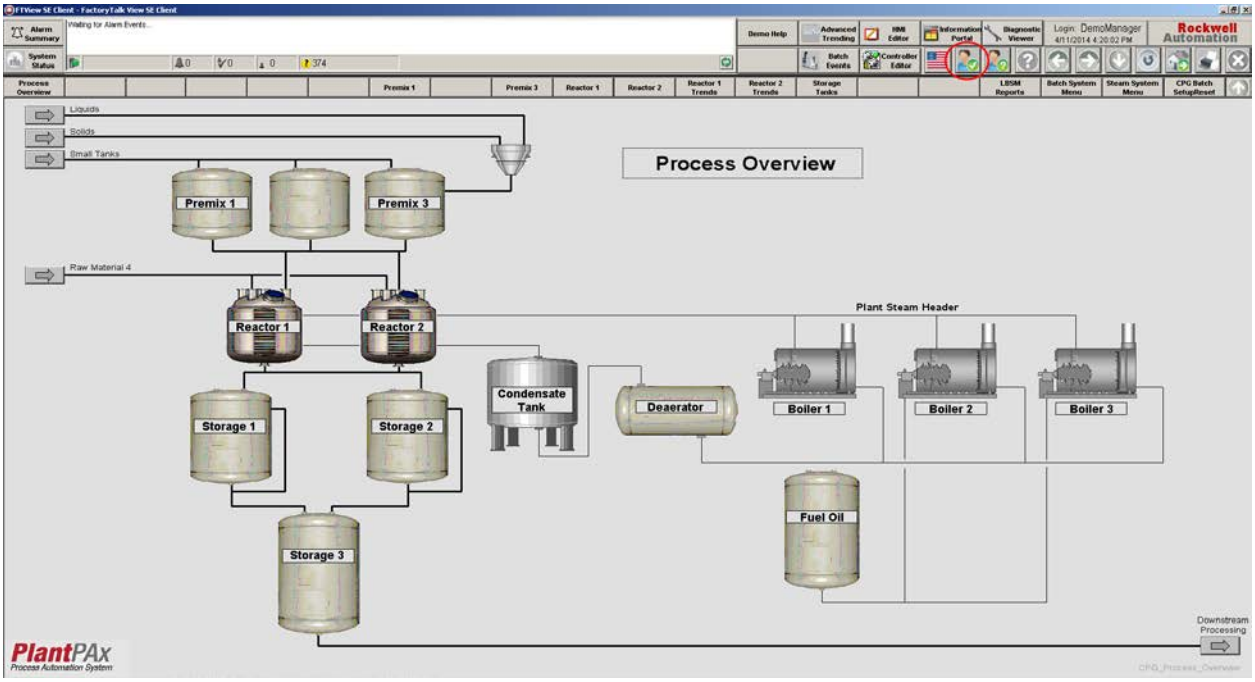
This user perspective will take you through the process of browsing sequences, creating a sequence, and running the automated sequence using LBSM. While the sequence is running, you will have a chance to explore the LBSM system while interacting with the sequence through standard operator tasks. These include: completing manual additions, initiating manual actions, hold/resume sequencing, advance/repeat steps and more. The user will also enable LBSM reporting and look at the preconfigured reports.

HMI Visualization & Navigation

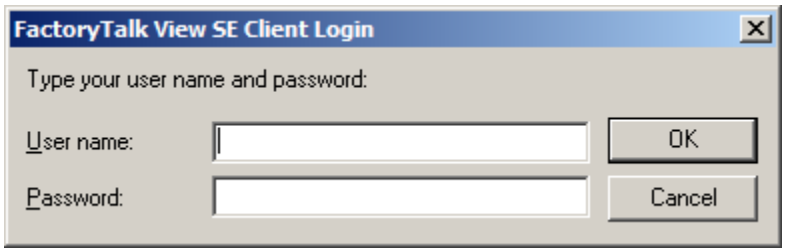
Security & Login

Logix Batch & Sequence Manager leverages standard FactoryTalk View security. The default application has been configured according to the base PlantPAx library object security model. For more details, refer to the LBSM user's manual.

4. From the Overview Display button bar, select the ***Login*** button in the top right hand quadrant of the display.



5. At the log on prompt, ***Log In*** as the Operator with User ID = '**BatchOper'** with the Password = '**Operator**' and **click *OK***.

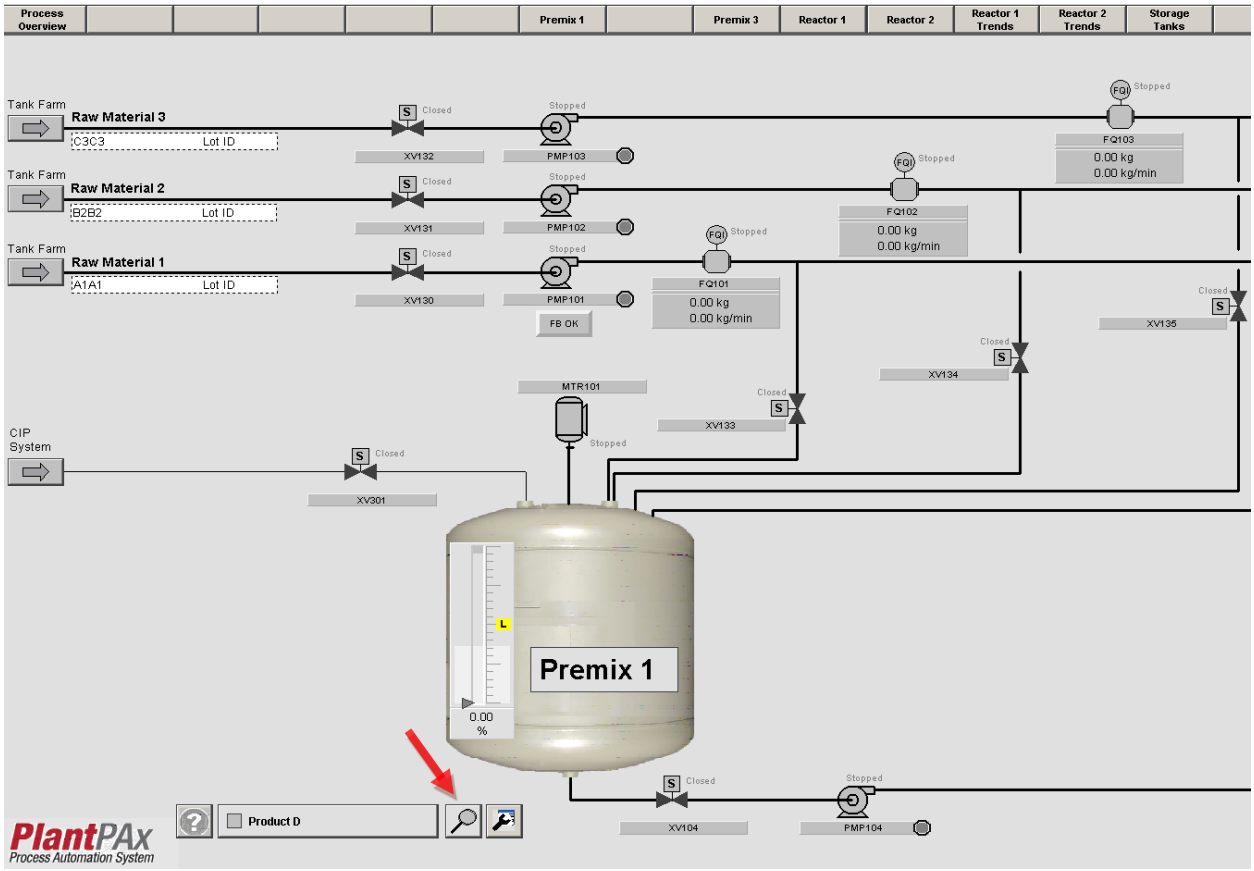


HMI Application

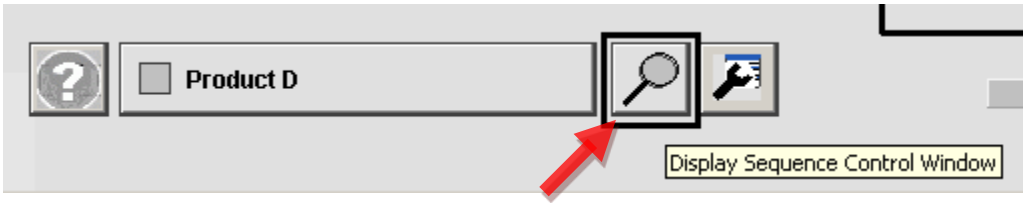
This section of the lab will familiarize you with basic HMI application.

1. ***Display the Sequence Control Window***. To display the Run-Time Sequence window open the ***Premix 1*** display by selecting the ***Premix 1*** button from HMI navigation bar..

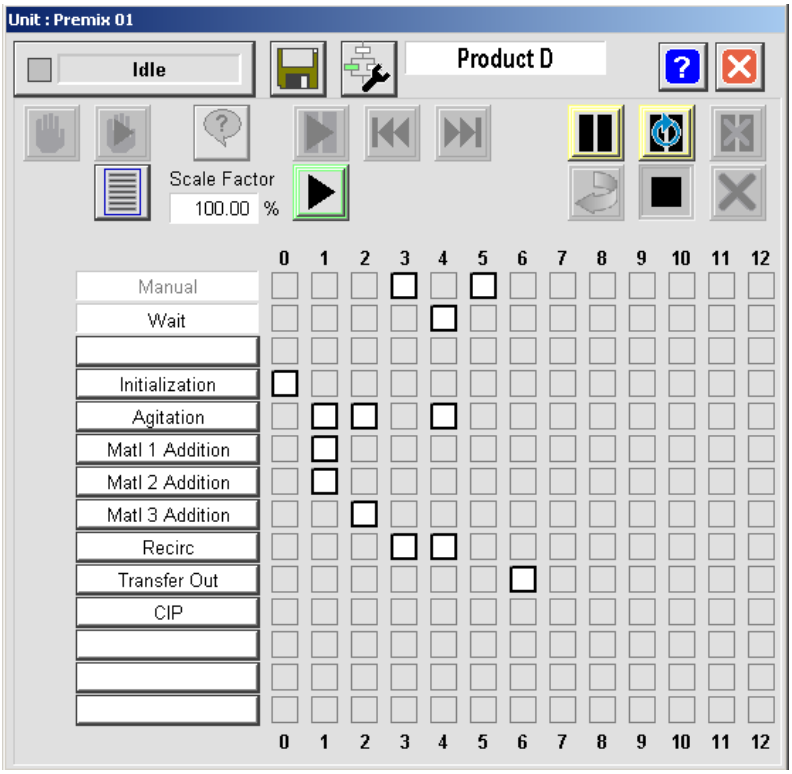
The **Premix 1** screen will open.



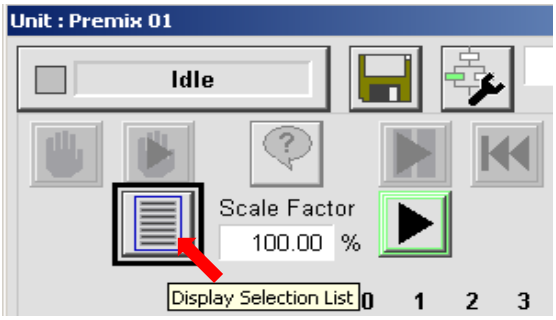
Then click on the ***magnifying glass*** to open the ***Sequence Control Window***.



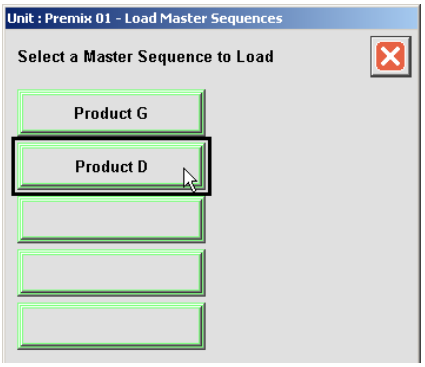
The Display Sequence Control window will open:



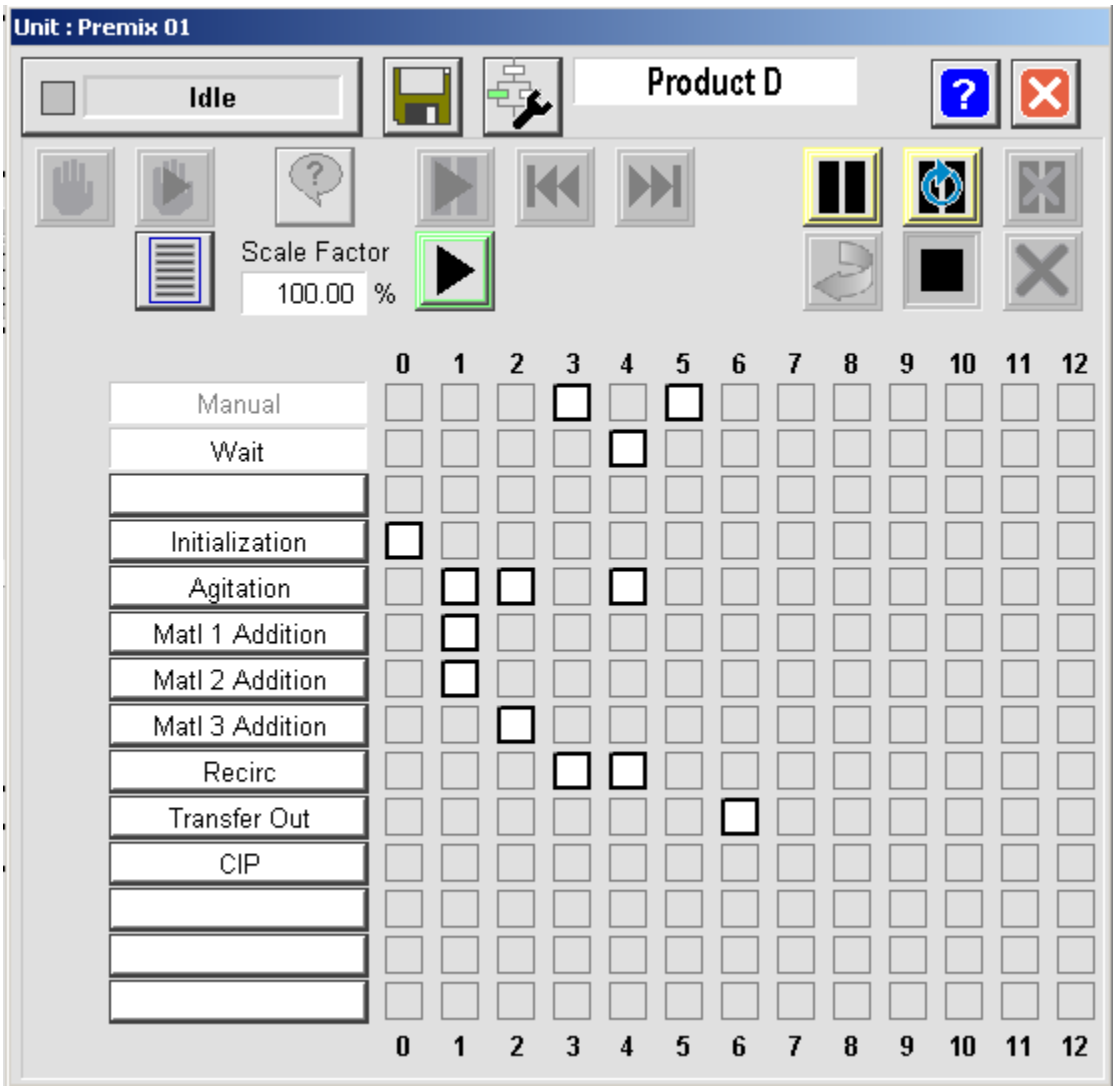
2. Click on the ***Display Selection List***.



3. Select ***Product D*** if it has not already been selected.

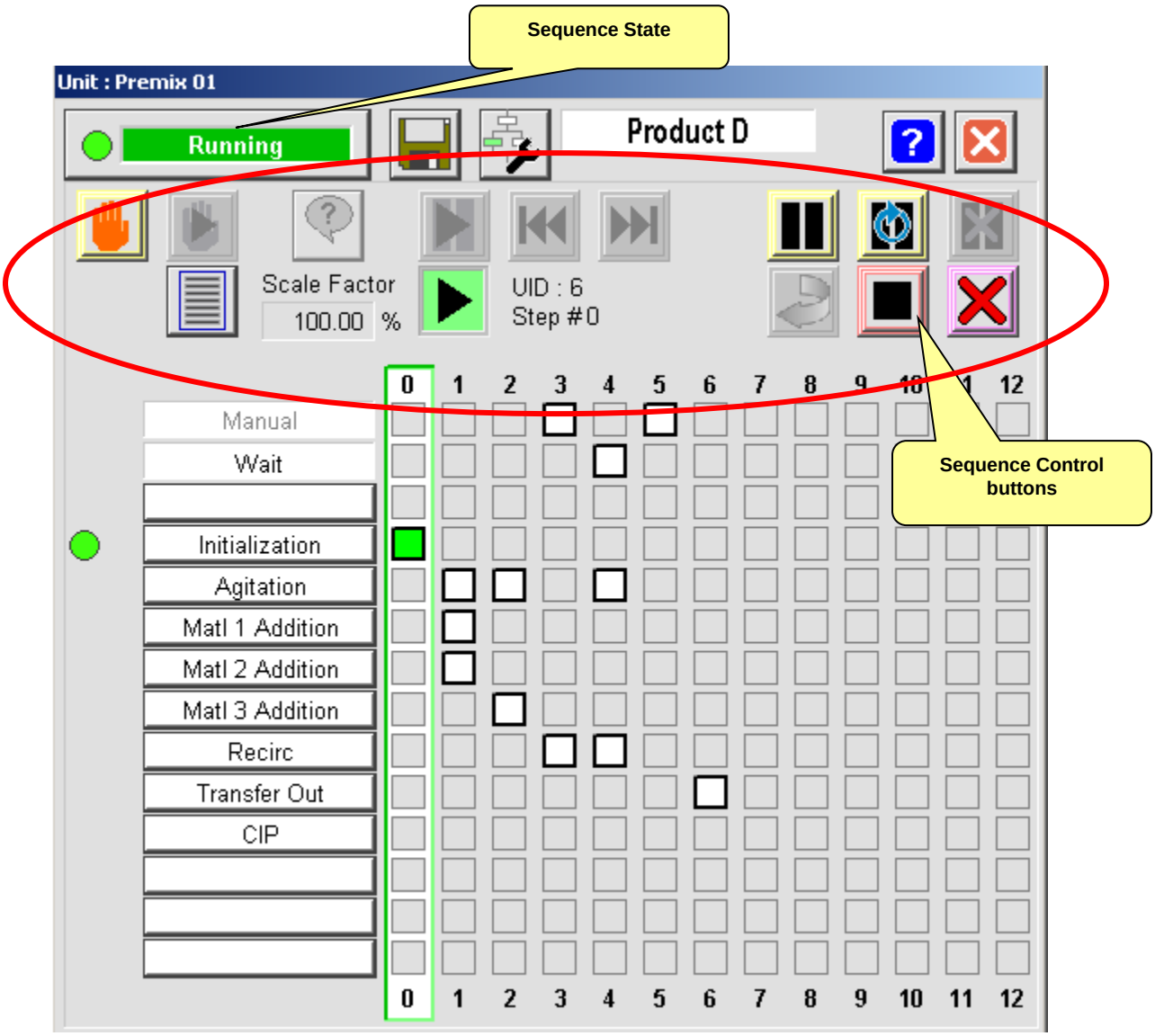


Now the sequence shown is for Product D.



4. Start the sequence, by clicking on the ***Start*** icon found on **Product D Sequence Display**.

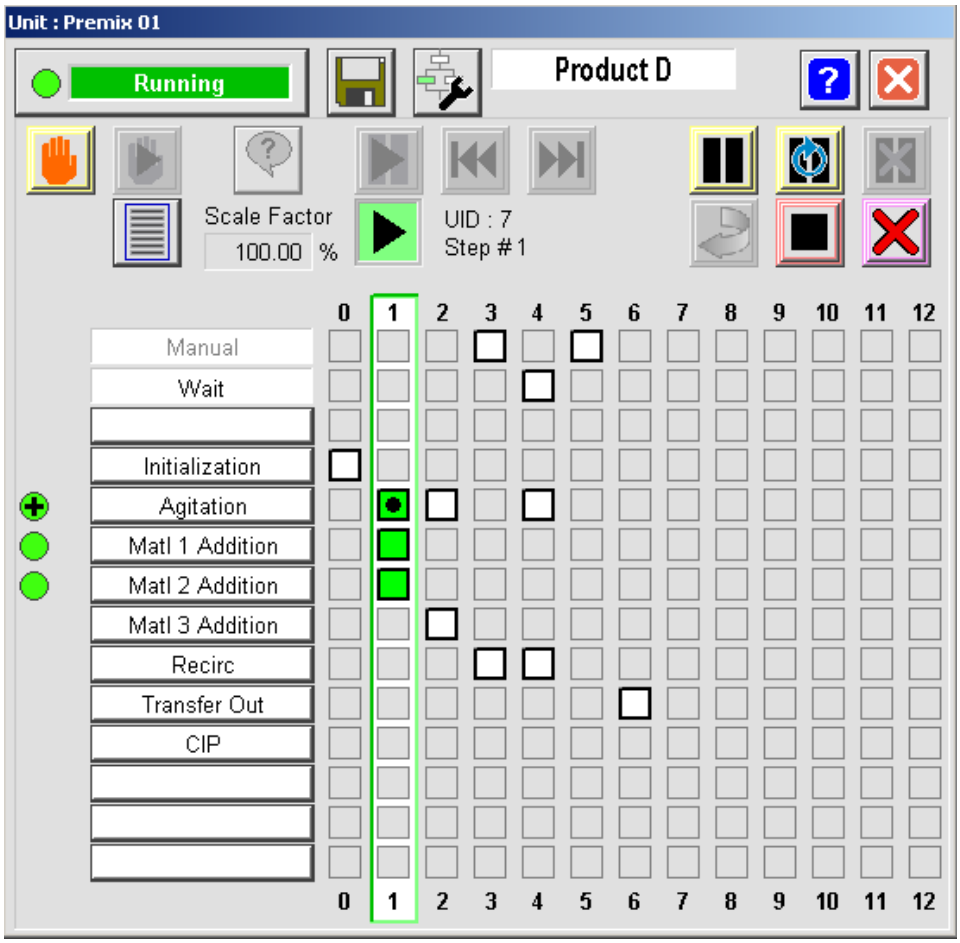
5. Note (a) that the sequence has transitioned from the “Idle” state to the “Running” state, and (b) the sequence command buttons (Hold, Stop, Abort) are now activated.

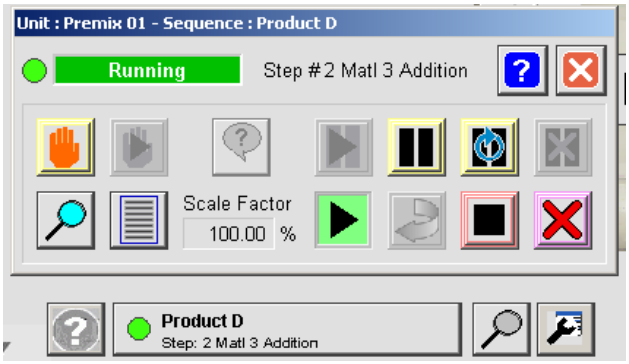


Run the Sequence

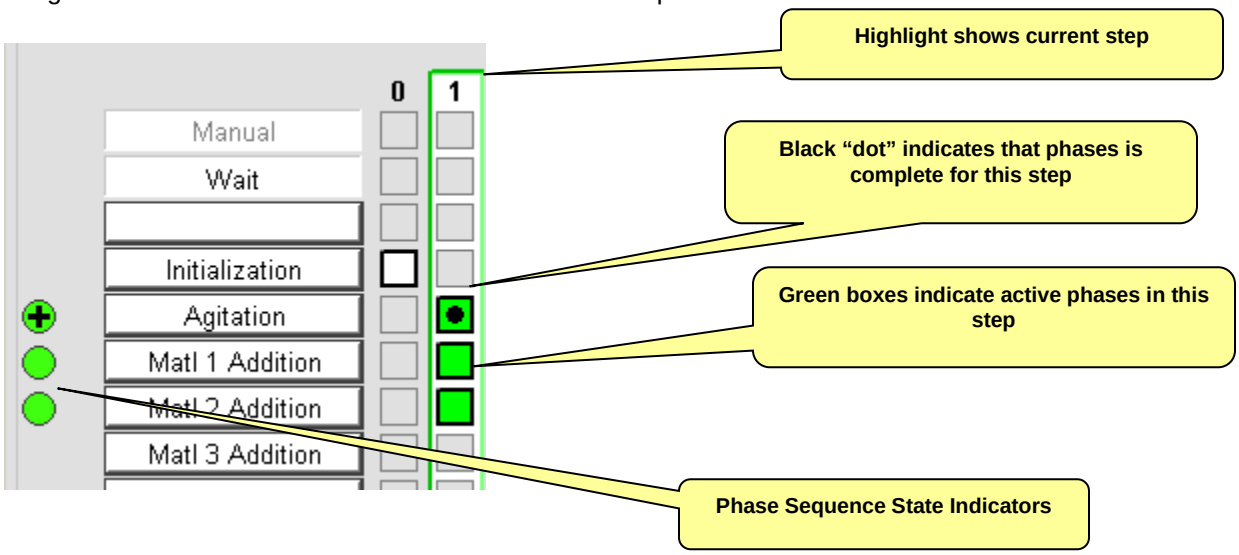
We will continue to run, monitor, and interact with the sequence that was started above.

1. The first step, step 0, “Initialization” completes, the sequence then transitions to step 1 where Additions 1 and 2 are dispensed automatically and the agitator starts when sufficient volume has been added to the tank. The sequence progress is represented as shown below. Sequence control activity can also be monitored on the dynamic process graphic. Shown at the bottom of the page.





2. A significant amount of information is available for the operator. Let's look at the screen in detail.



   a. A rectangular outline highlights the current step

   b. A green box indicates that the phase, in that step, is active

   c. A black dot indicates that the phase, in that step, is complete

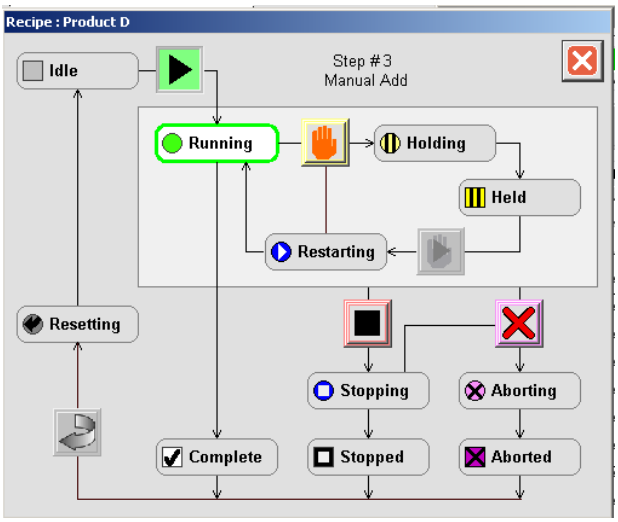
   d. A green box with a black dot indicates that the phase has completed its actions but is still active. Typically this will be seen for phases that transition several steps such as agitation.

   e. The indicators at the far left display the current phase state.

The vertical axis displays the configured equipment and current phase status.

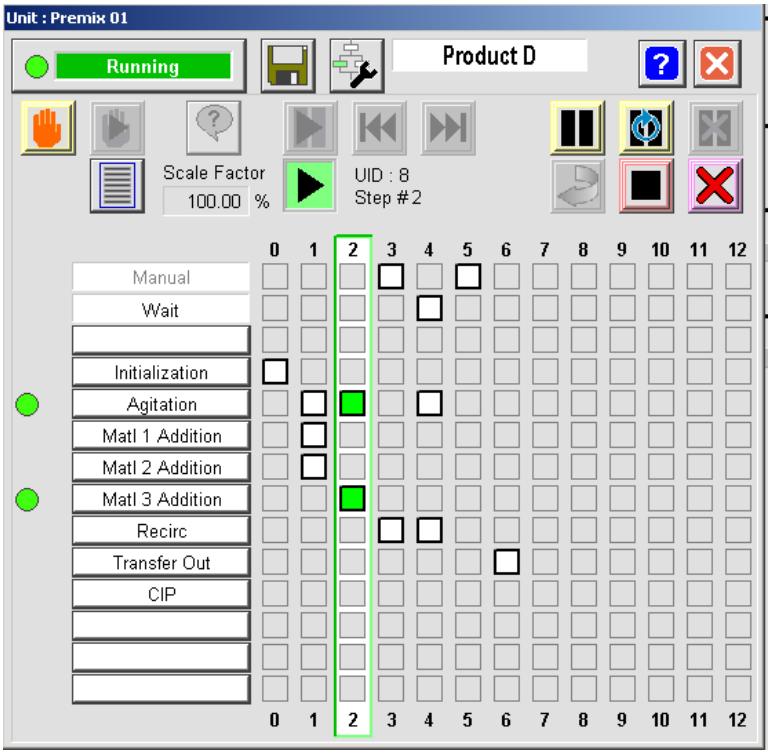
A key to the indicators can be found by clicking on the Sequence State

which displays the following:



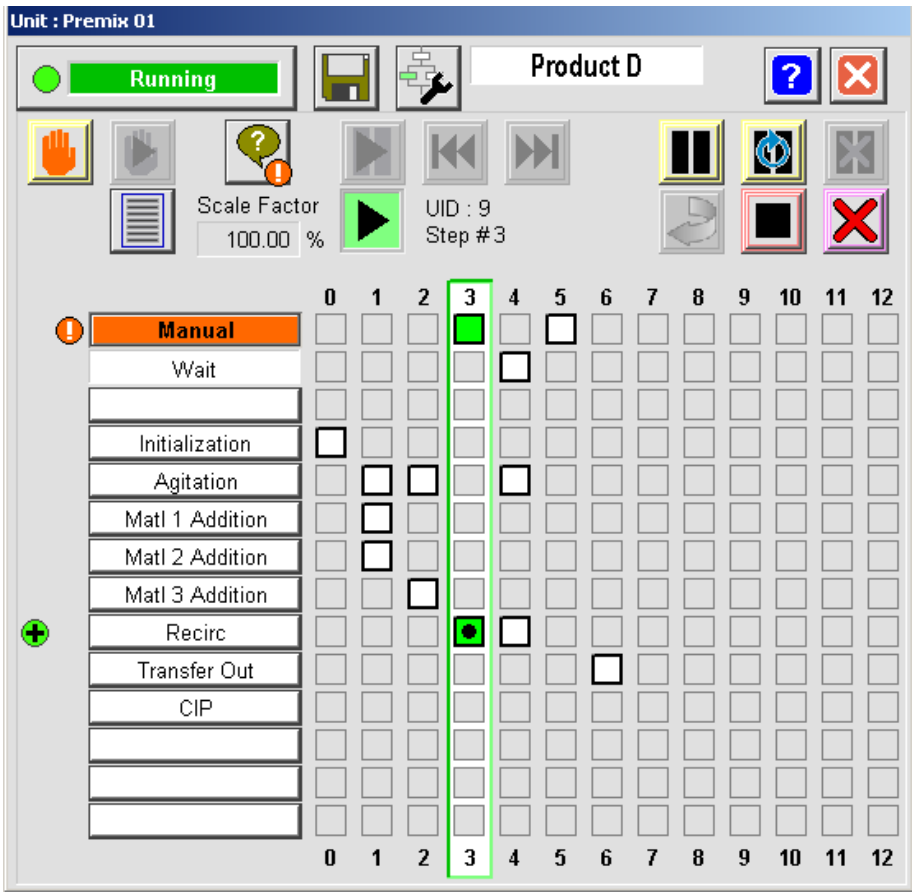
The sequence state diagram is both functional and a key to the control icons.

3. Once both Material 1 and 2 additions are complete, the sequence progresses to Step 2, where Material 3 is added also while agitating.



The Display Sequence Control windows has been size such that most of **Premix 1** display is visible and allows the process actions to be observed.

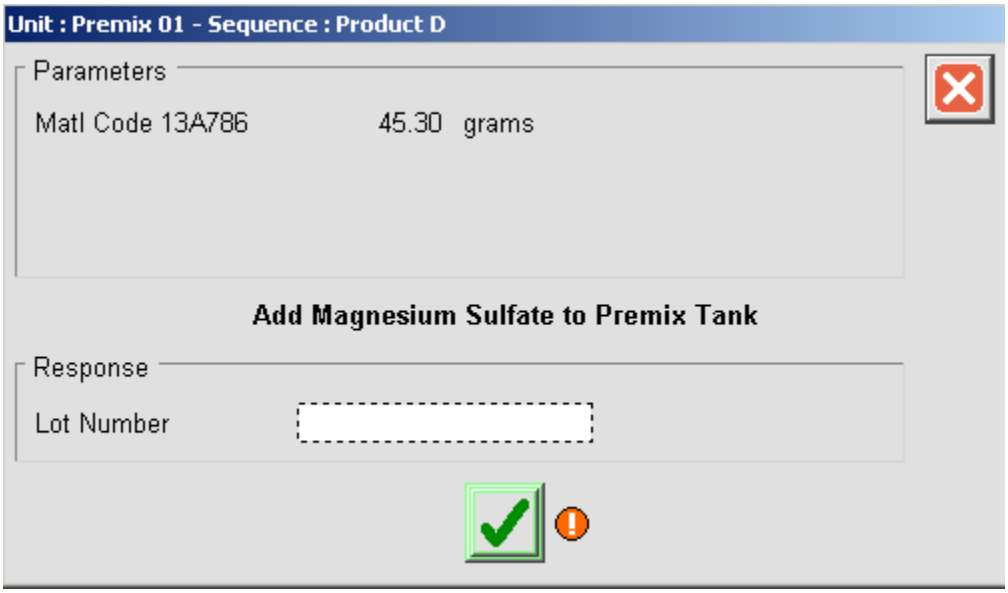
4. The sequence progresses to Step 3, after the Material 3 addition is completed. At this point agitation stops, recirculation begins (see PreMix display), and a Manual phase is initiated. The blinking, orange, Manual Phase indicator and an exclamation mark indicate operator attention is required.



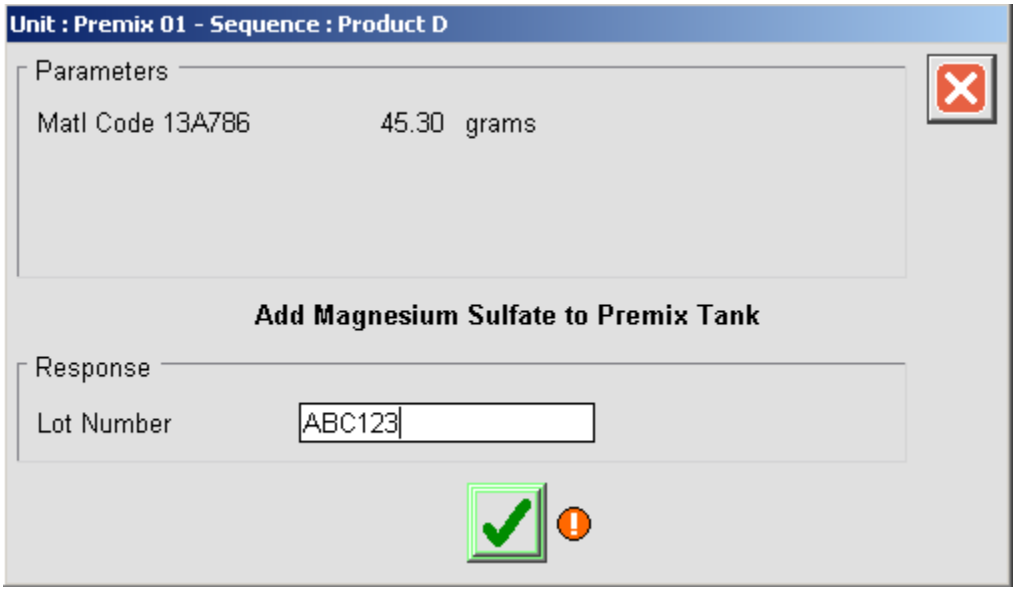
5. Clicking on the blinking ***Manual*** phase box

displays the Prompt Popup. Or you can click on the ***Respond to Manual Prompt Request*** button.

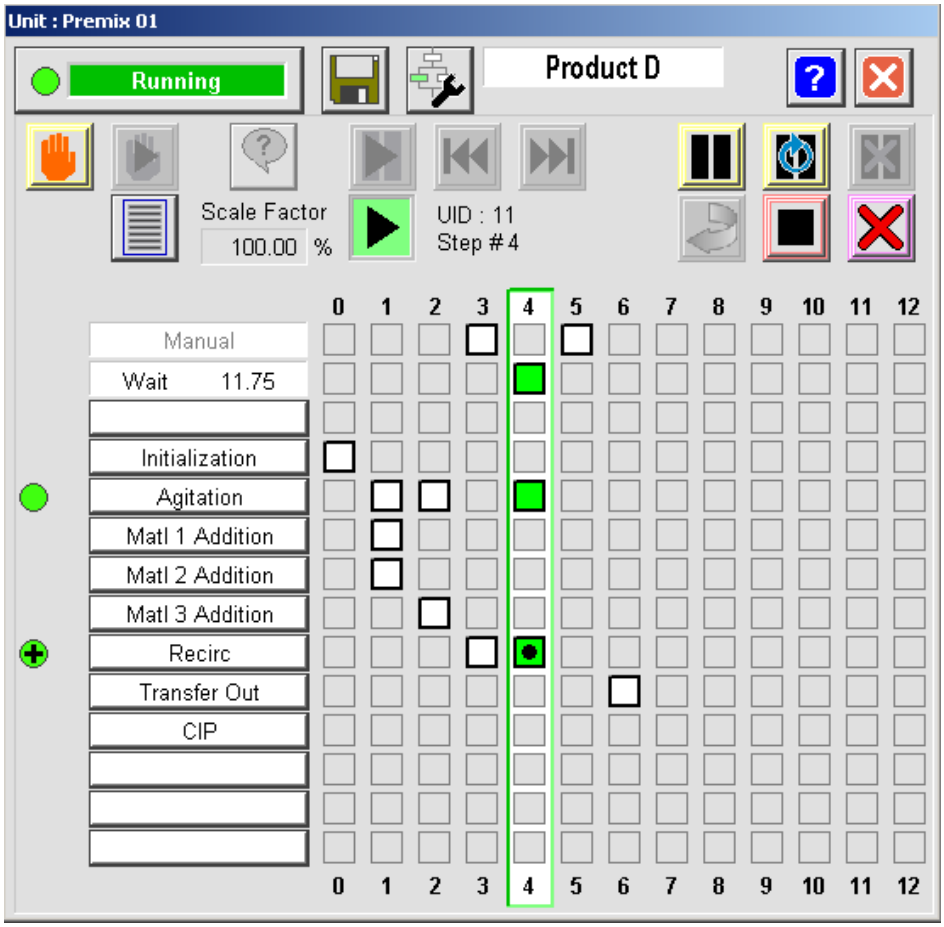
The Manual input window opens:



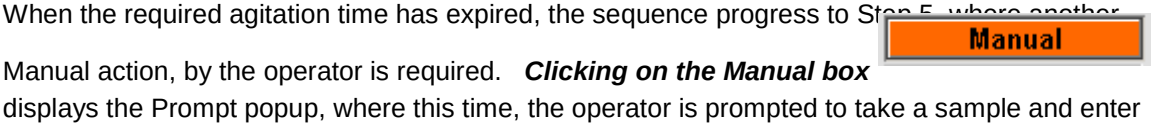
6. After reading and performing the actions indicated in the Prompt popup, the operator would enter a Lot Number and acknowledge the prompt by ***clicking on the checkmark***.

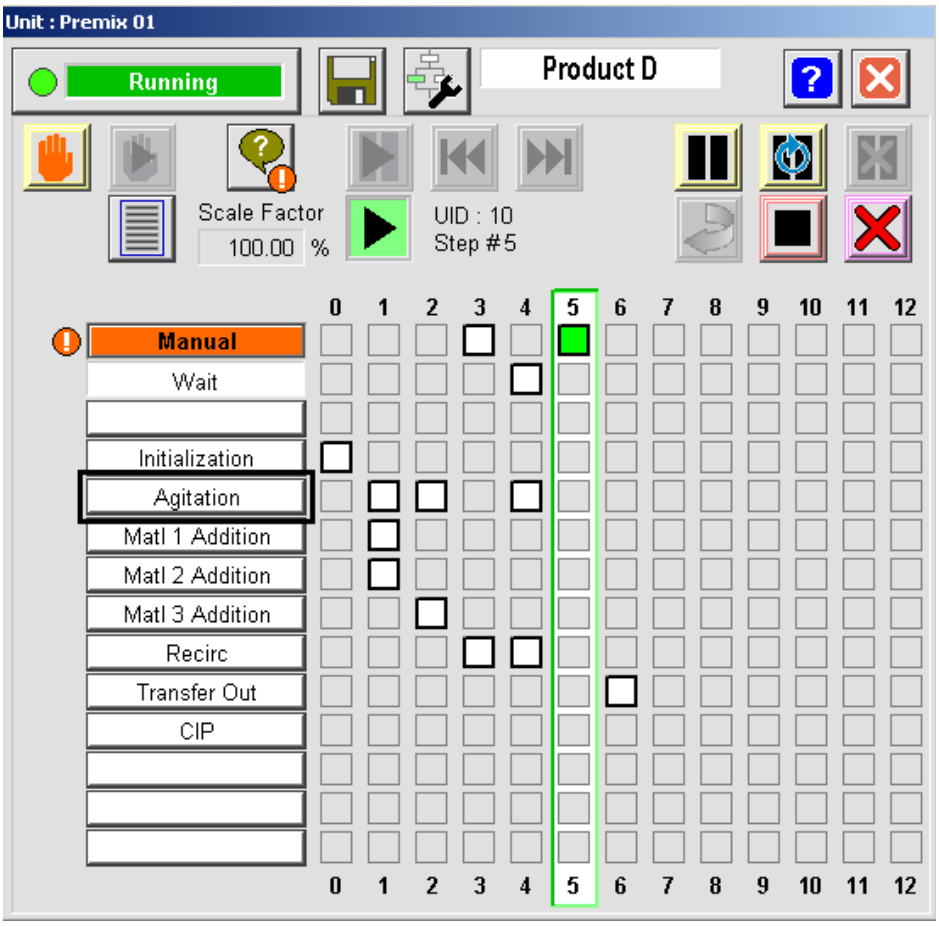


7. The sequence progresses to Step 4, where Agitation while circulating contents takes place. The time setpoint is a formula parameter of the Agitation phase, therefore the phase will complete when time has expired. The Recirculation phase has completed the transition requirements but will continue until the Agitation phase is also complete.

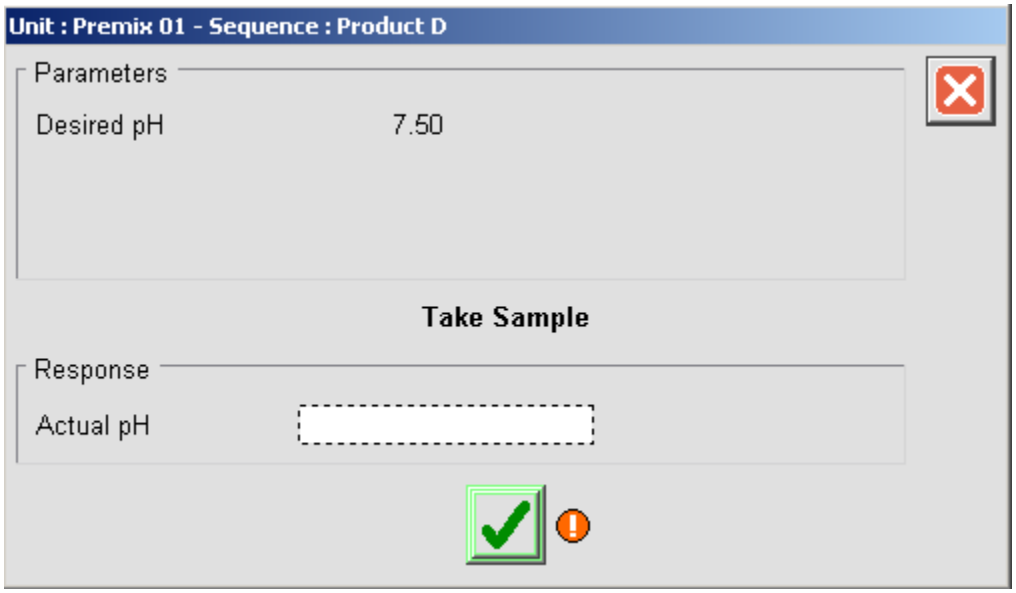


8. When the required agitation time has expired, the sequence progress to Step 5, where another Manual action, by the operator is required. ***Clicking on the Manual box*** displays the Prompt popup, where this time, the operator is prompted to take a sample and enter the results.

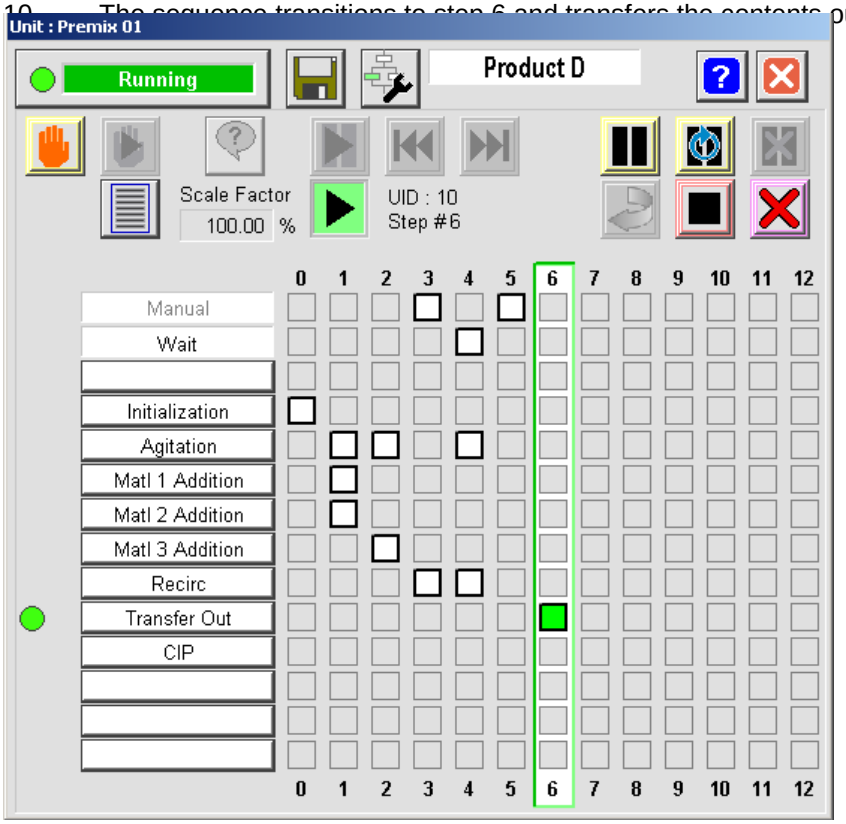




9. Enter a value for the actual pH, '***7.5***' and press the ***ENTER*** key. After entering the data, acknowledge the prompting by ***clicking on the green checkmark***.

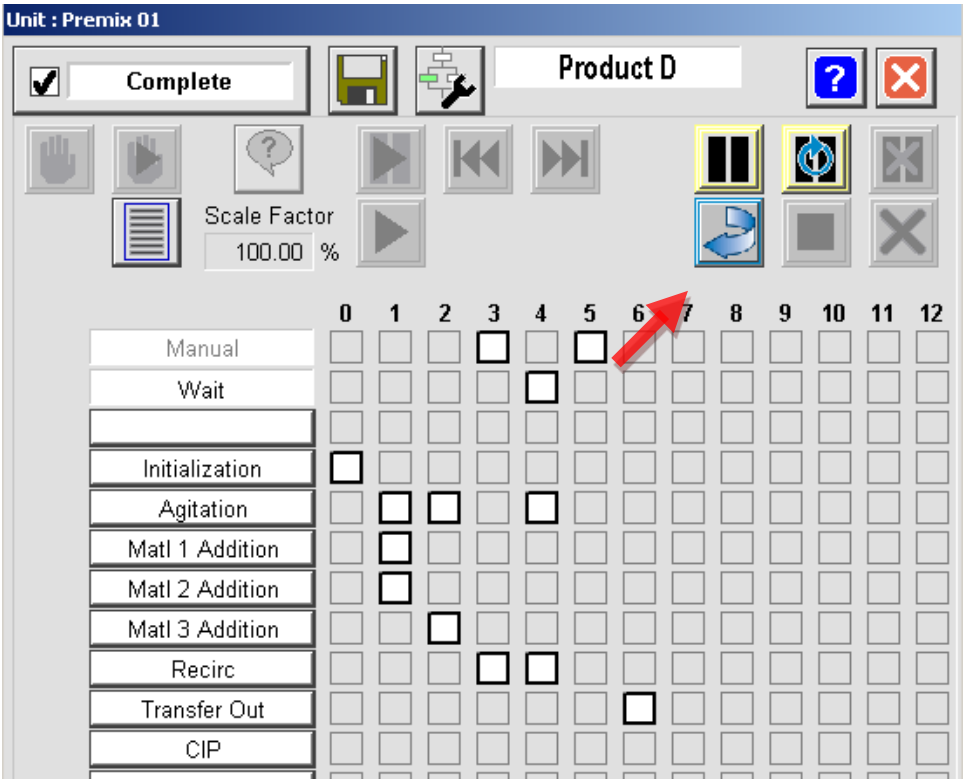


10. The sequence transitions to step 6 and transfers the contents out of the tank.



In the PreMix display note the open valve, pump on and the tank level dropping.

11. After the tank is empty, the sequence is complete. No steps are active, the sequence state is “Complete” and the “Reset” button is active.



12. Pressing ***RESET SEQUENCE*** returns the sequence to the “Idle” state.

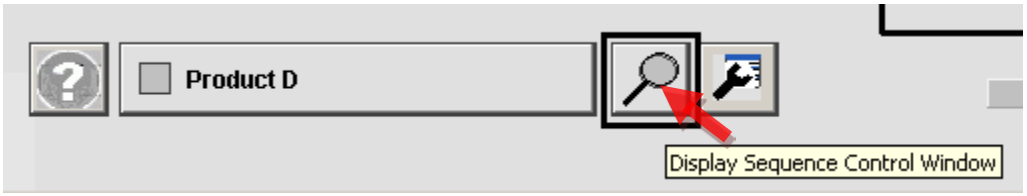
13. ***Close*** the “Product D Sequence Display” by ***clicking on the red ‘X’***

Run the Sequence

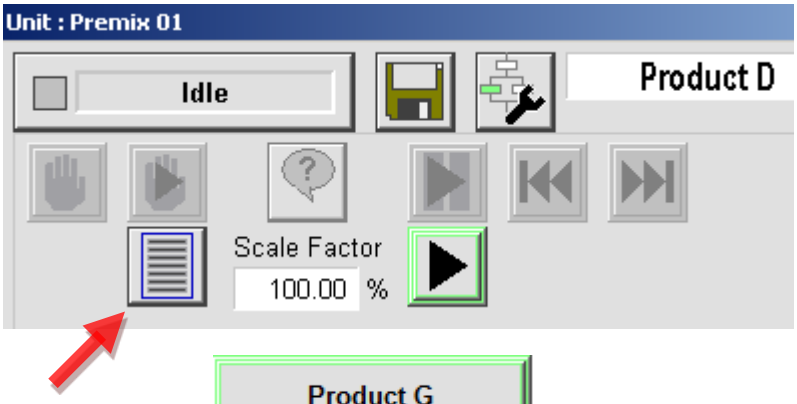
Let's run another sequence to show the functions LBSM provides to the operator for additional sequence interaction and control. We will explore the Pause and Skip, Hold/Resume, and Manual Phase control features.

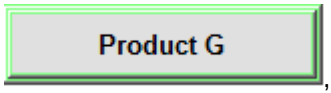
Pause and Skip

1. Click on the ***Display Sequence Control Window*** button in the lower left of the Premix 1 display.

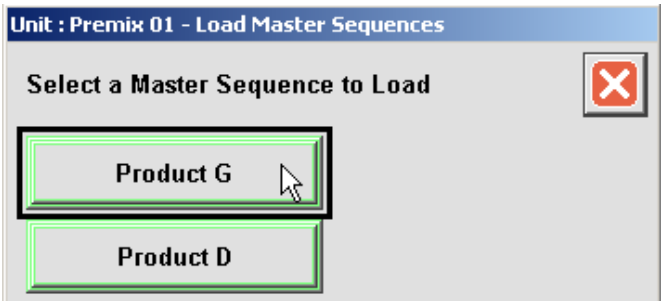


The Run-time Sequence window will appear. Click on the ***Display Selection List*** button.

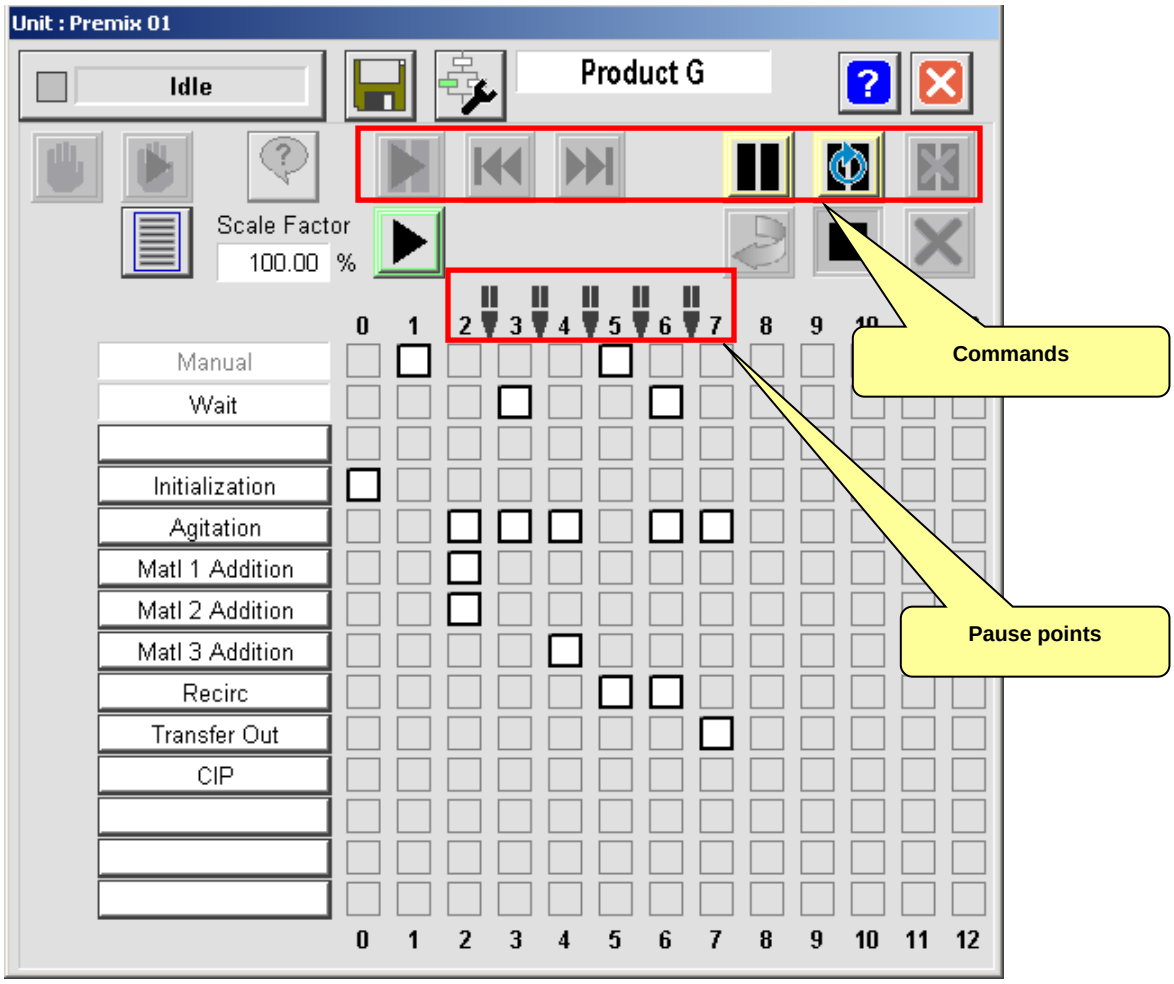


2. Select ***Product G*** 

, the Run-Time Sequence display will open.



3. Notice that for this product, “Pause” points have been configured into the sequence

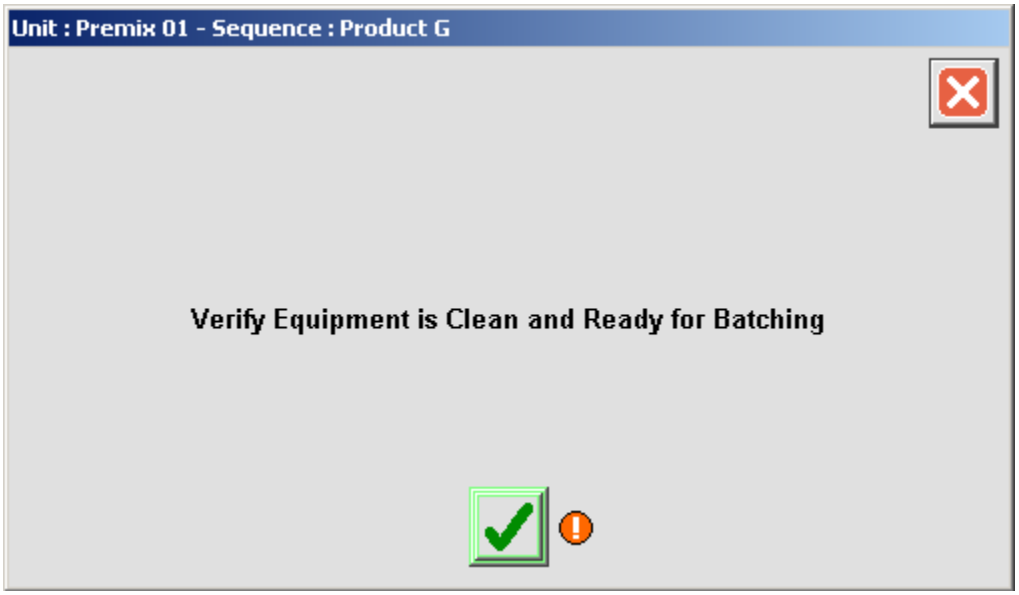


Commands

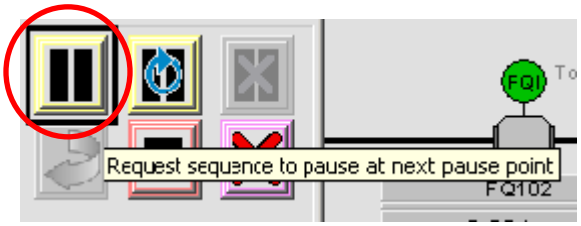
Start Command	Stop Command. Perform an orderly shutdown of running sequence.
Reset Command	Abort Command. Perform an emergency termination of running sequence.
Hold Command	Restart Command
Pause Request. Request sequence to pause at next pause point	Auto Pause Request. Request sequence to pause at each pause point
Resume Command. Resume a paused sequence	Cancel Pause Request. Cancel a Pause or Auto Pause Request
Skip to Previous Pause Point. Available when sequence is paused	Skip to Next Pause Point. Available when sequence is paused

4. ***START*** a sequence of “Product G”

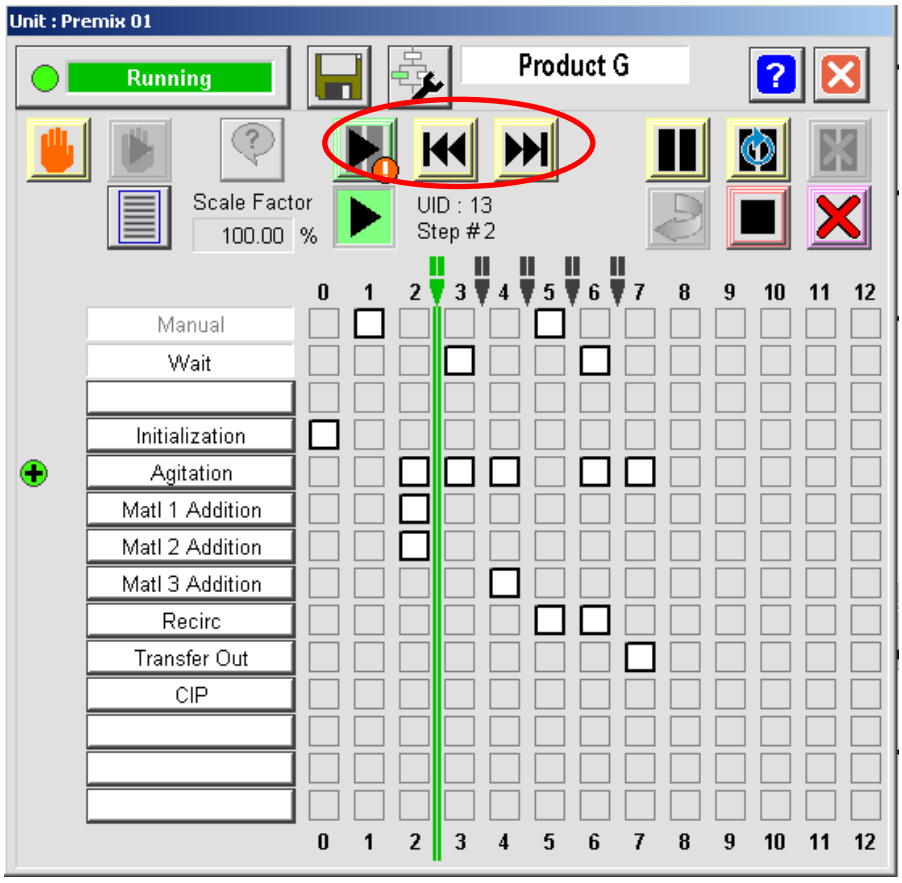
5. When step 1 is reached acknowledge the manual step.



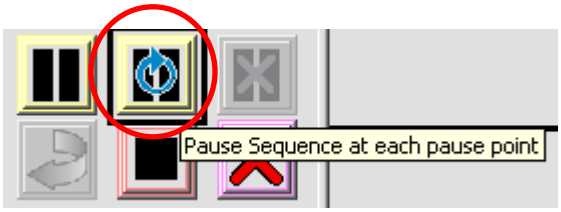
6. Let’s suppose that during the first material additions, Step 2, the operator wanted to check the tank before continuing with the timed agitation in Step 3. Note that there is a configured pause point between Step 2 and Step 3. Therefore, the operator can select ***Request sequence to pause at next pause point***. Click this button.



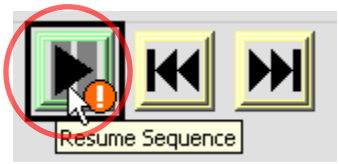
7. At the end of the material additions, Step 2, we see that the sequence has paused, being indicated by a green bar and pause point. Furthermore the “Step Control” buttons are now active.



8. The operator can continue to select “Request sequence to pause at pause point” or one can select to enable “Auto Pause,” where the sequence will automatically pause at every configured pause point. Let’s go ahead and ***Pause sequence at each pause point*** by checking the appropriate box.

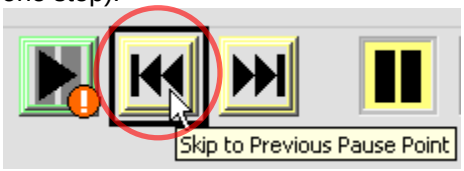


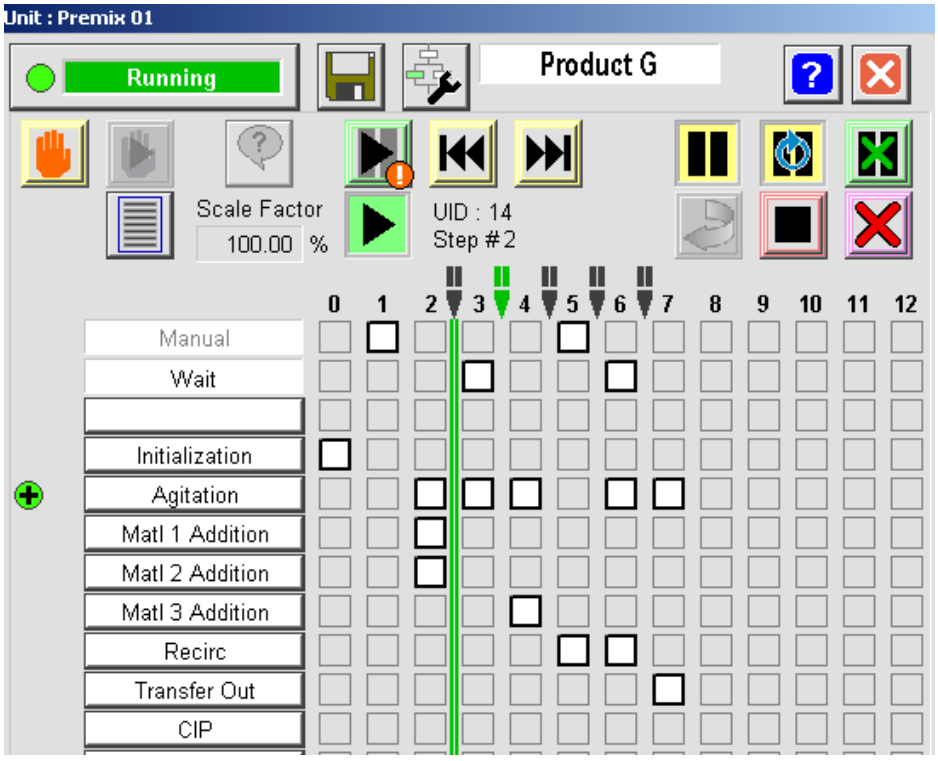
9. At this point, the operator can step forward to the next pause point or continue from this point. Let's continue from this point by pressing ***Resume Sequence***.



10. The sequence progresses with the timed agitation, Step 3. At the end of the time agitation, the sequence is again paused. Let's assume that after checking the tank contents, the operator needed to repeat the timed agitation. Press the ***Skip to Previous Pause Point*** button.

Notice that the sequence has indexed back to the previous pause point (which could be more than one step).



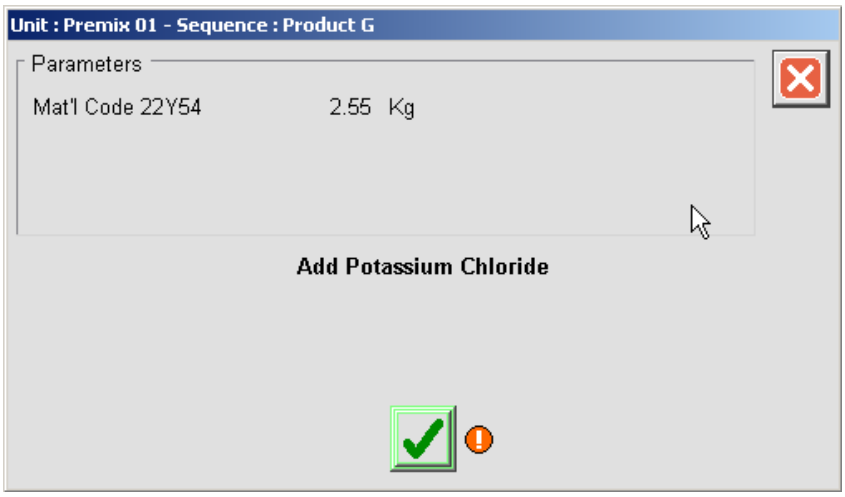


11. Continue the sequence by pressing ***RESUME SEQUENCE***.

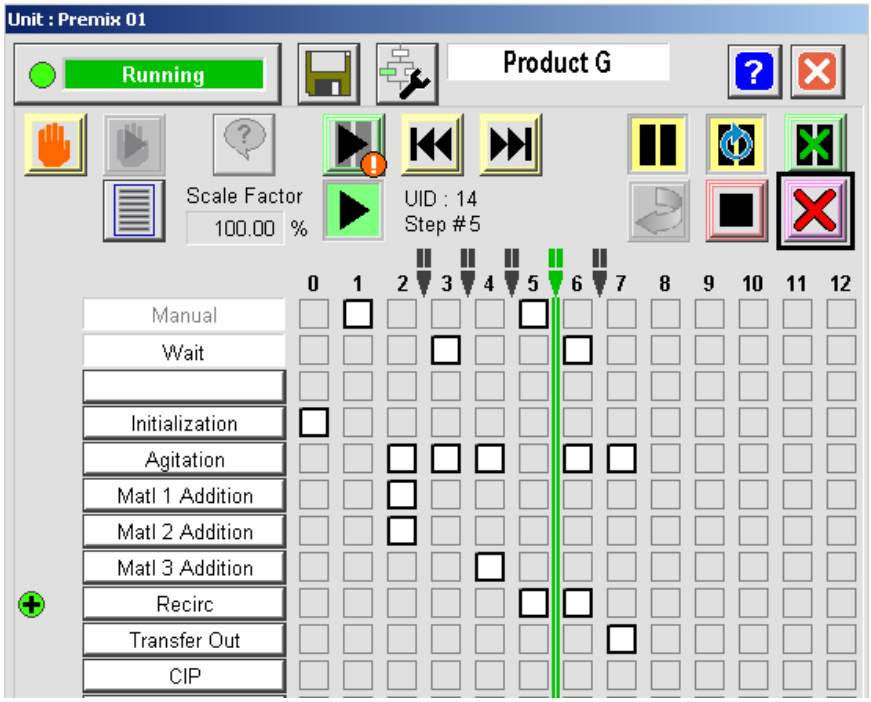
12. The same process works for skip forward; again noting that a user can skip as many steps as needed to get to the next configured pause point.

Hold and Resume

1. After the timed agitation, continue the sequence by pressing ***RESUME SEQUENCE***.
2. After Matl 3 is added in Step 4, continue the sequence by pressing ***RESUME SEQUENCE***.
3. Acknowledge the manual prompt, Step 5, by pressing ***ACKNOWLEDGE***.



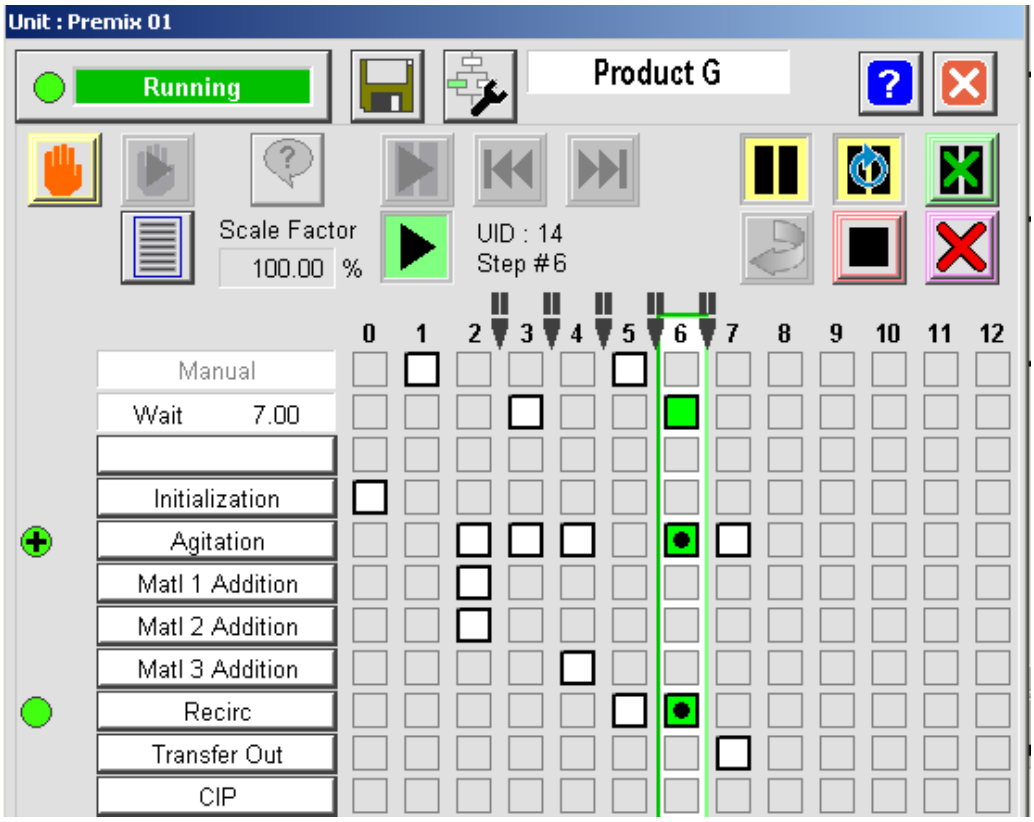
The sequence will again stop at a pause point.



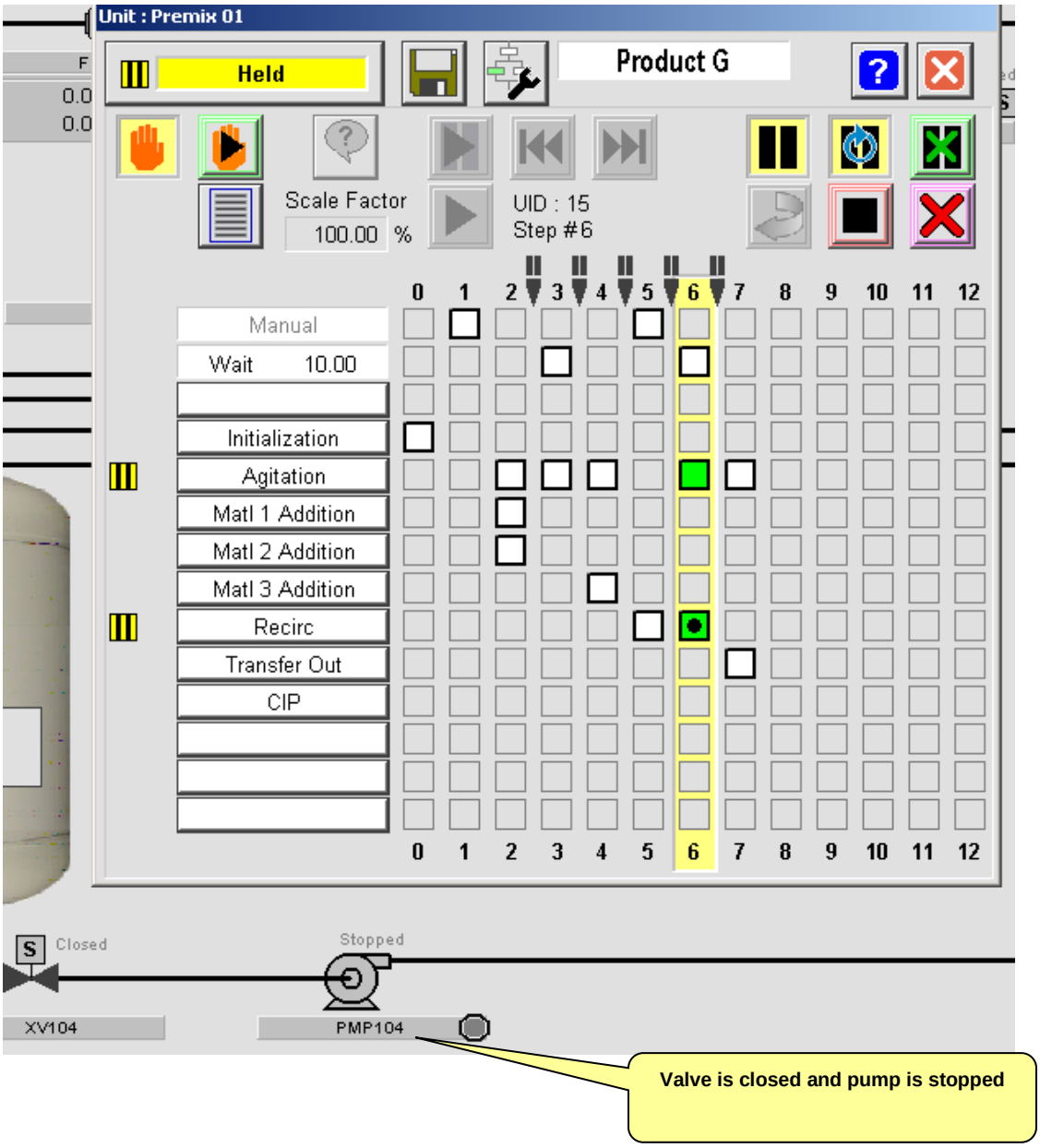
4. Before pressing ***RESUME SEQUENCE*** to step on to step 6, read the next step's instructions and be prepared to put the sequence in "Hold." ***RESUME SEQUENCE*** and move to step 6 when ready.

5. Now, suppose during the timed mixing cycle, Step 6, the operator needs to stop the circulation and check the connection on the transfer pump. Press ***HOLD*** to transition all active phases into their respective hold states.

Lab 5: Logix Batch & Sequence Manager



You can view the Premix Overview process graphic to see that the recirculation has stopped.

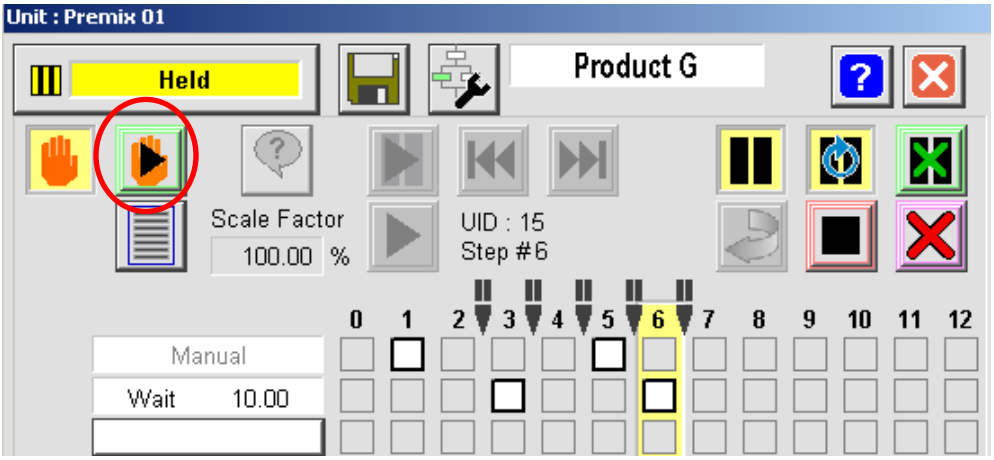


Note: The Sequence Status and Control screen can be displayed by pressing the "Sequence Button" in the lower left corner of the process graphic.

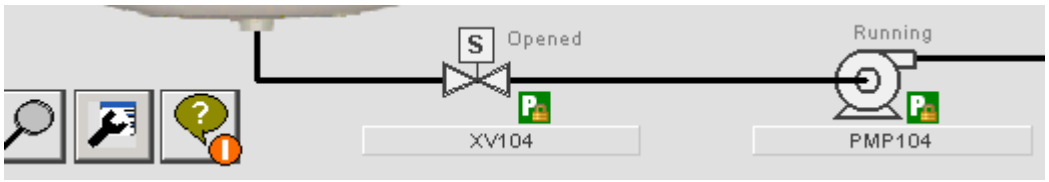
This button allows one to easily toggle between sequence display / control and the process graphic.

This button shows the current sequence, the sequence state, and the current step.

6. After tightening the Tri-Clamp on the pump, the operator can continue the sequence by pressing the ***RESTART SEQUENCE*** button.

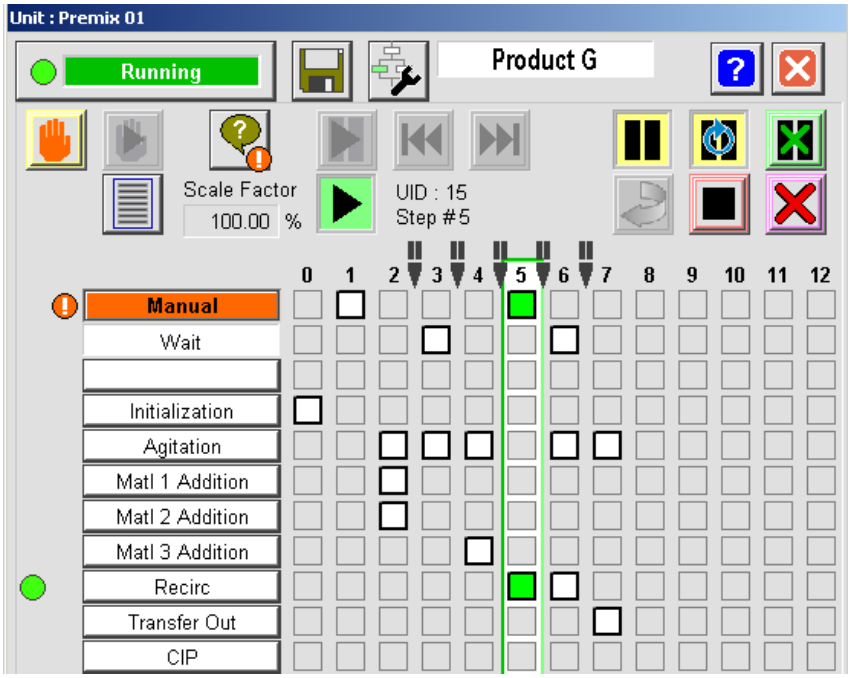


7. If you check the Premix Overview process graphic, you will see that the recirculation has continued from where it left off.

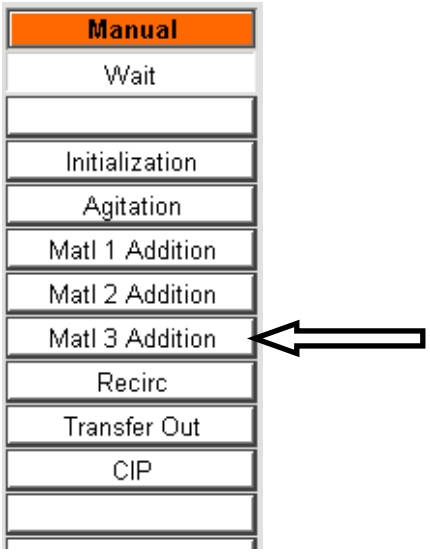


Manual Control

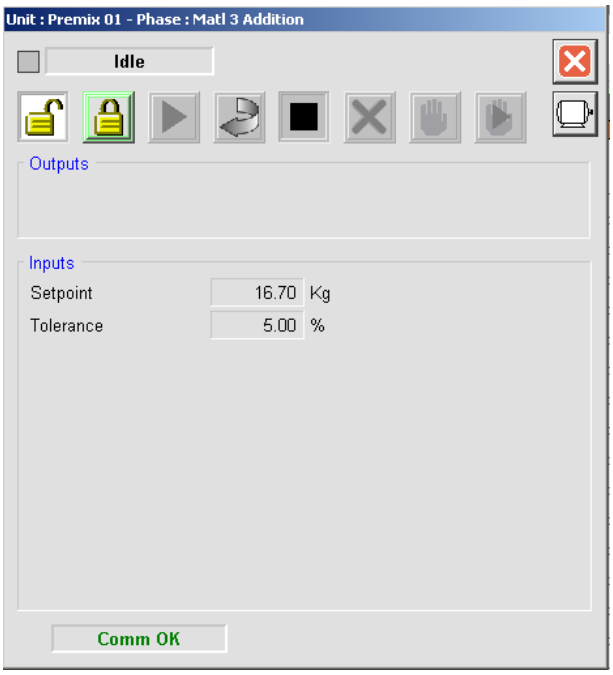
1. Suppose, that after the timed agitation completes in Step 6, we need to take another sample, because of the pump failure. Step Back and Resume the sequence at Step 5. The sequence should appear as follows:



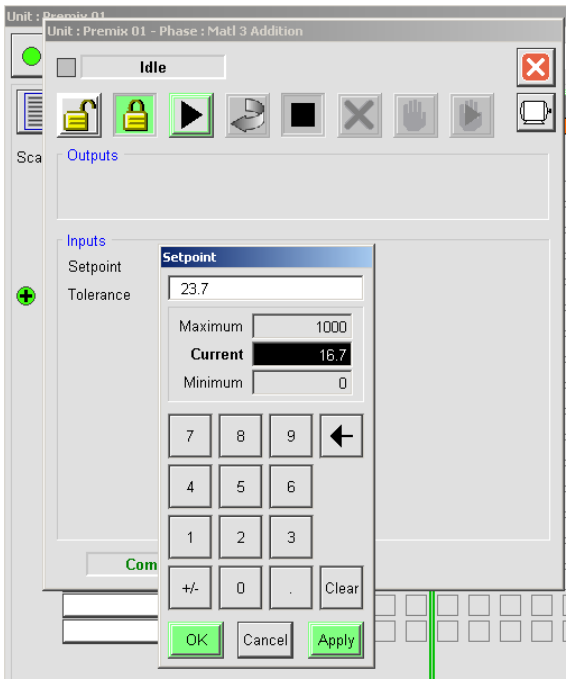
2. Now suppose that after taking and analyzing a sample, the operator needs to add more Material 3. Click on ***MATL 3 ADDITION*** in the phase listing and the Manual Phase Control popup appears.



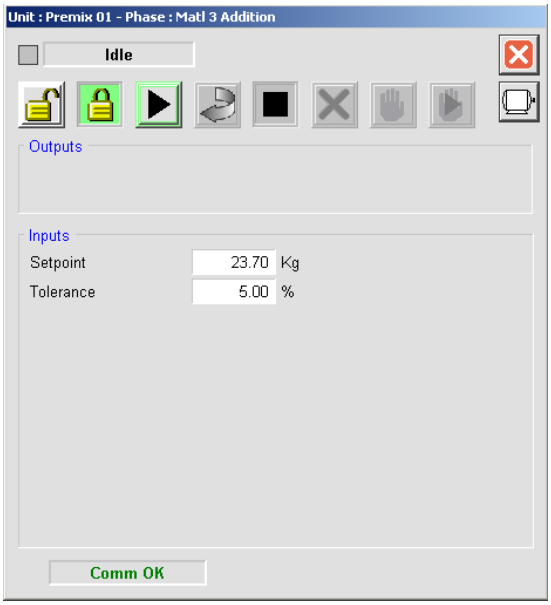
3. Take ownership of the phase by pressing ***ACQUIRE***.



4. Click on the setpoint field and enter a setpoint of ***'23.7'*** Kg and then click ***OK***. Also enter a tolerance of ***'5'*** %.

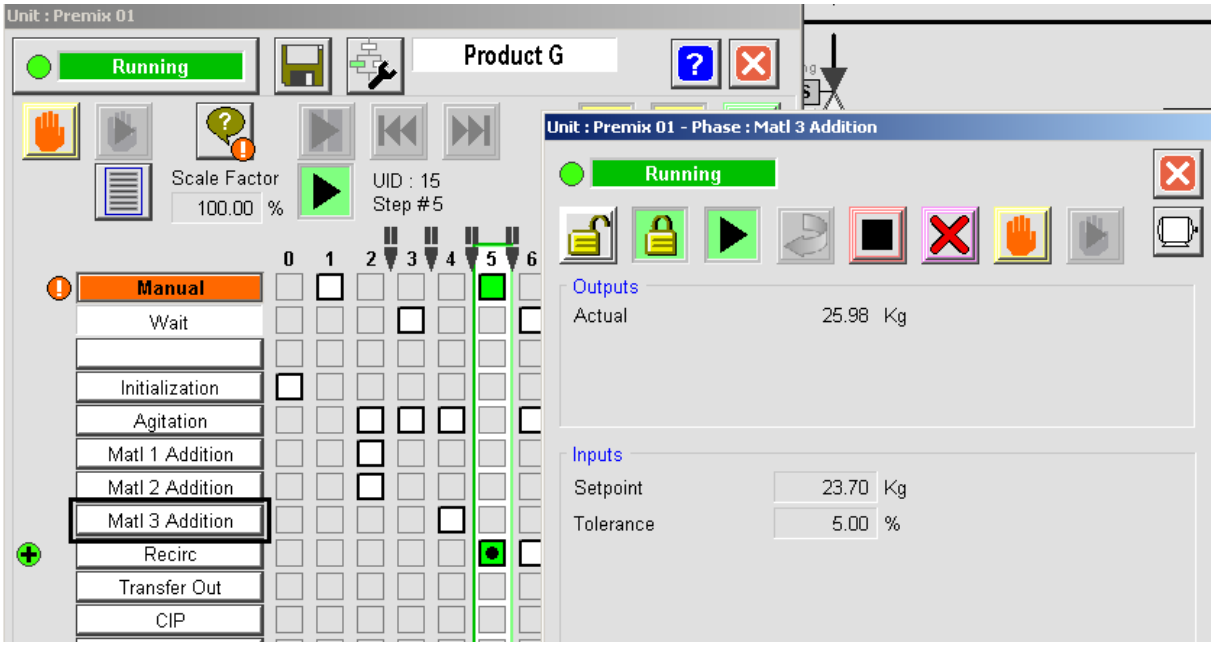


5. Then press ***START Phase***.

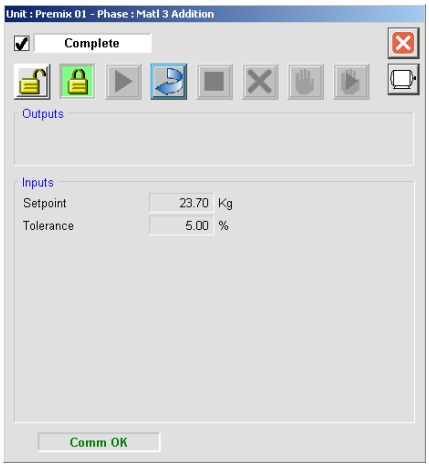


6. The addition begins, which can be seen both on the Premix Overview process graphic and by the phase status on the Manual Phase Control popup.

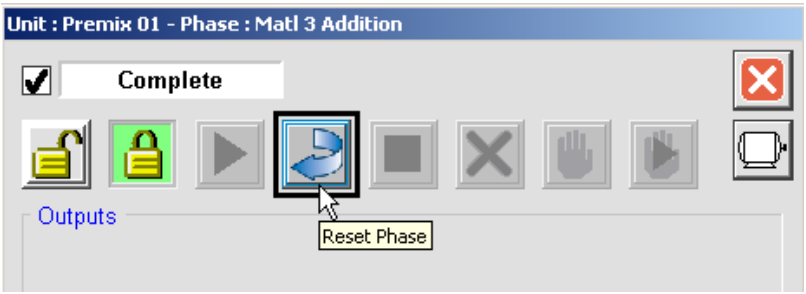
Lab 5: Logix Batch & Sequence Manager



7. After completing the addition, the phase transitions to “Complete.”



8. Reset the phase back to the “Idle” state by pressing ***RESET***.

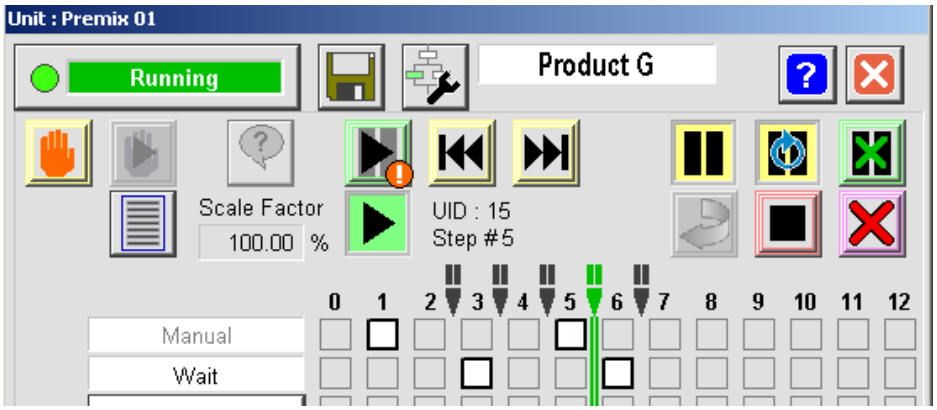


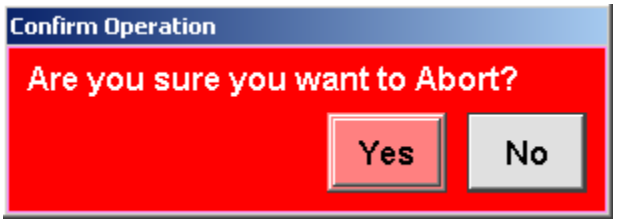
9. Release the phase from manual control by pressing ***RELEASE Equipment***. and close the Manual Phase control window.

> Manual Phase Control can be initiated anytime, with or without a sequence running. Furthermore, the sequence can be in any state, (e.g. running, held) for manual phase control.

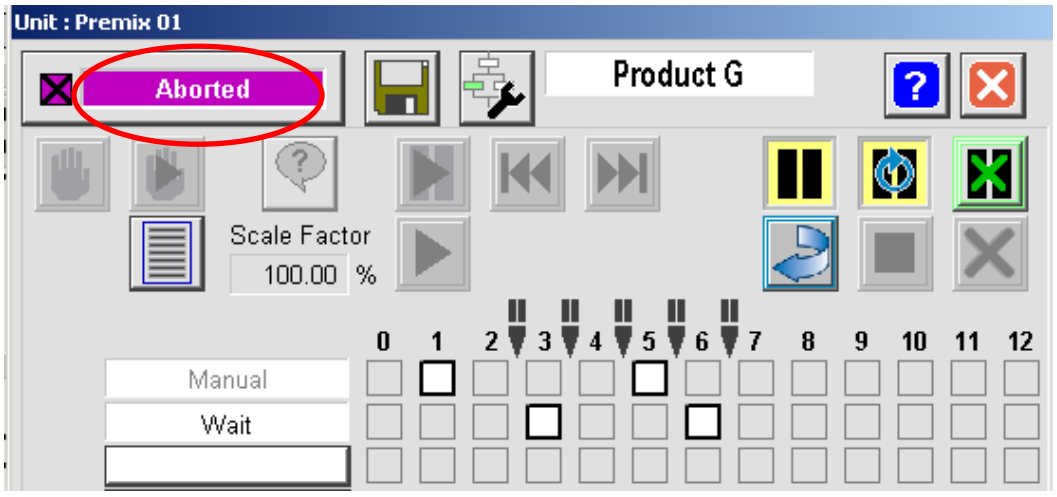
Abort Sequence

1. At this point we realize the sequence cannot be salvaged and needs to be aborted. Press ***ABORT*** . Click ***Yes*** to confirm this decision.

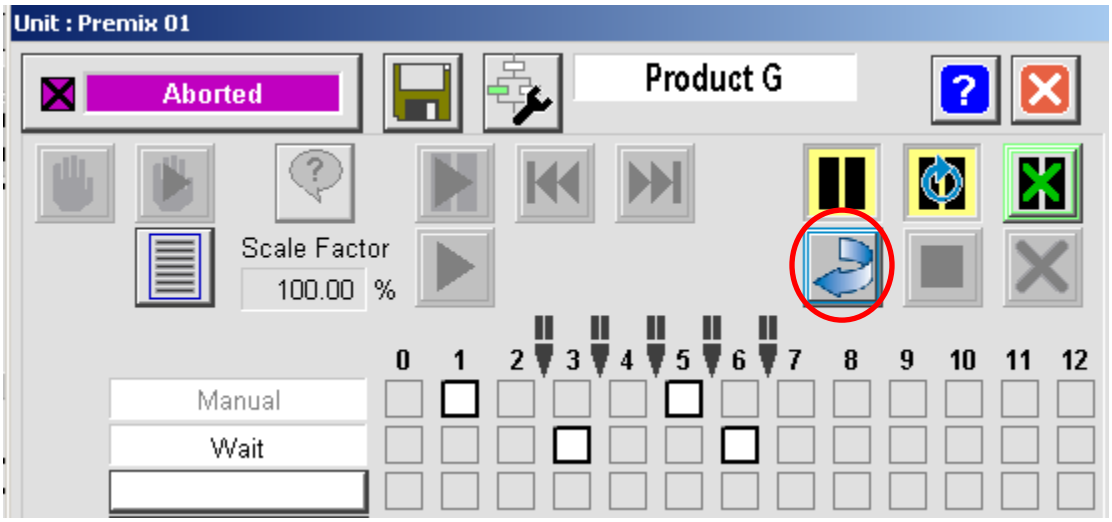




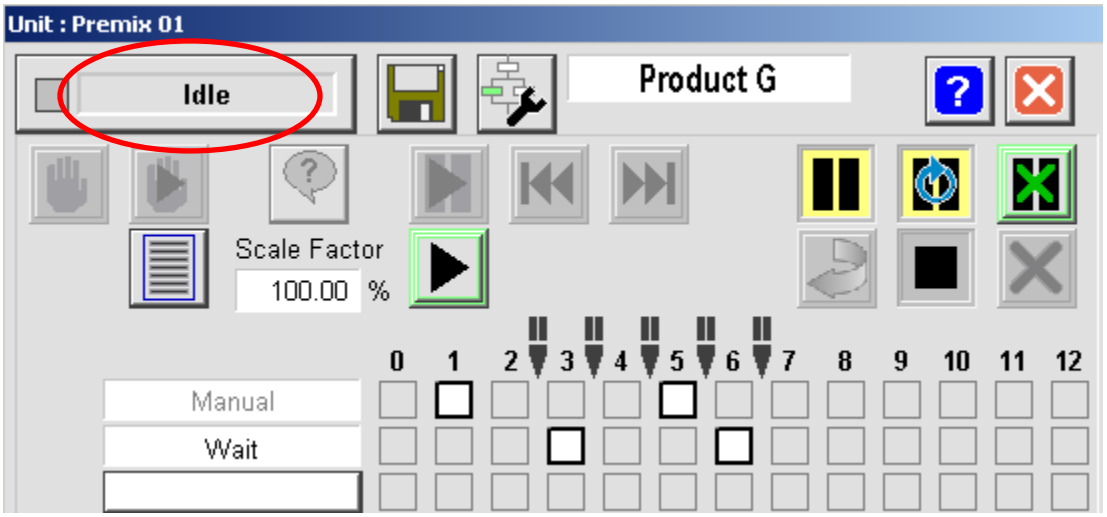
2. All phase activity aborts and the sequence transitions to the “Aborted” state.



3. Press ***RESET*** to return the sequence to the “Idle” state.



4. The sequence and system returns to “Idle.”



Lab 5: Logix Batch & Sequence Manager

LBSM Reporting

The **Logix Batch & Sequence Manager v1.5** reporting add on uses a modified database from the FactoryTalk Batch reporting package to store data from the LBSM batches running in the controller. Let's take a look.

Note: LBSM Reporting currently only works with FactoryTalk ViewSE.

The following reports are pre-developed.

010 – Batch Listing

- Provides a list of batches that meet a user's search or query criteria

020 – Batch Summary

- Offers batch specific summary information on batch data (step time) and setpoint vs. actual

030 – Batch Detail

- Offers batch specific detailed information on batch data (step times, parameters, reports).

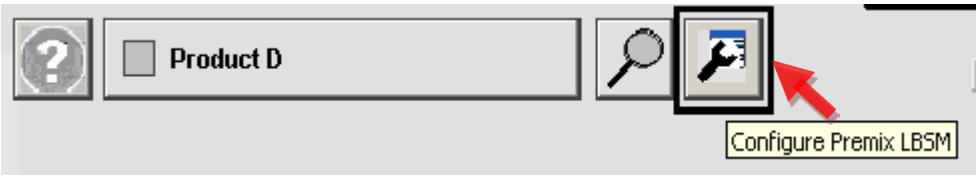
070 – Batch Execution

- Review a specific batch's step execution times in a bar chart format.

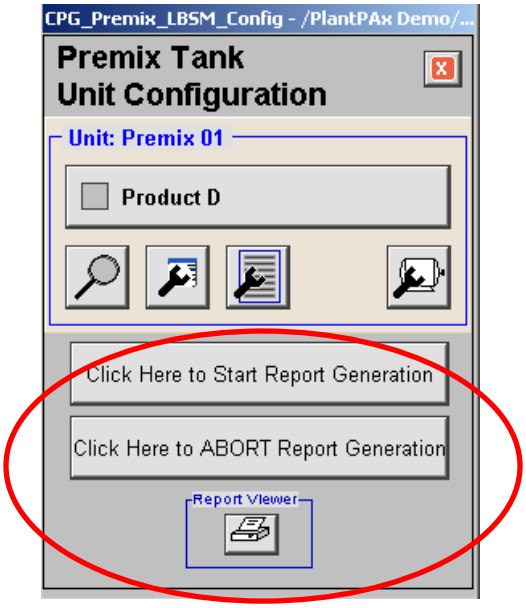
080 – Duration Comparison

- Compare the durations of multiple batches in a bar chart format.

1. To enable LBSM Reporting select the "Configure Premix LBSM" button in the lower left quadrant of the Premix 01 display.

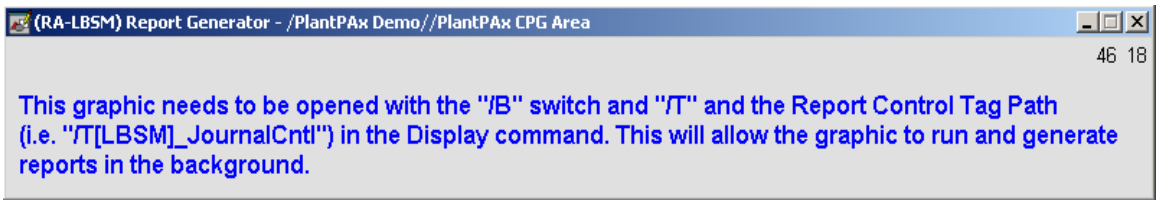


2. This brings up the "Premix Tank Unit Configuration" popup, the three buttons on the bottom half of the popup are used for LBSM Reporting.



3. Select ***Click Here to Start Report Generation***

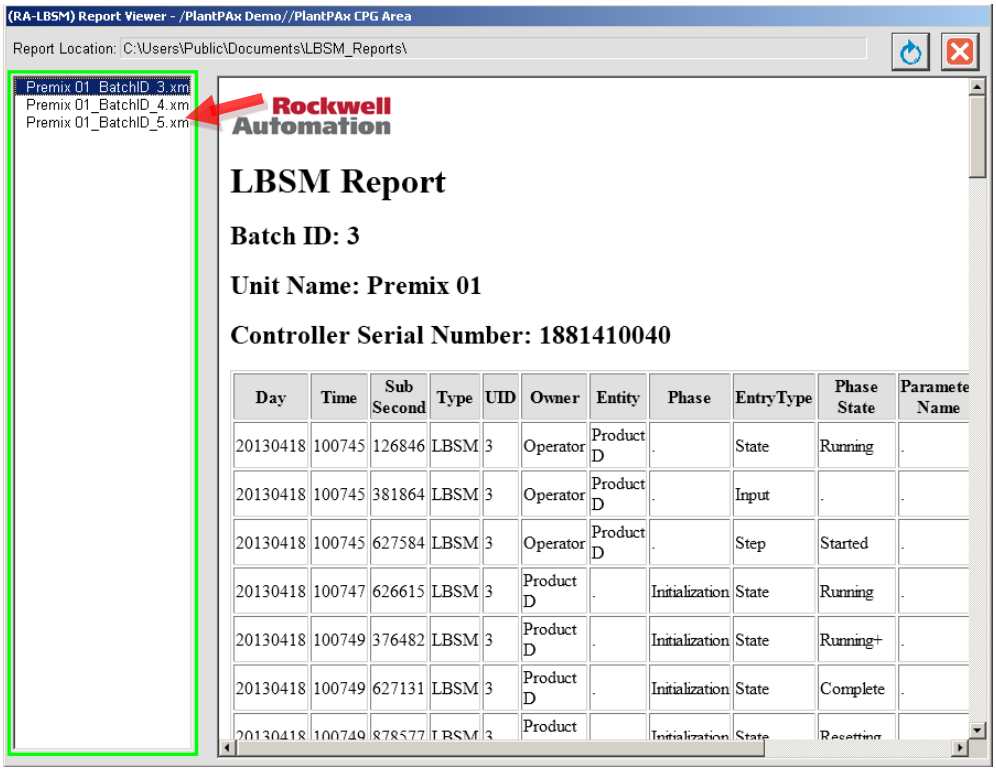
4. This brings up the small display below. This display contains VBA code that takes the data from tags running in the controller and places it in a XML files and a SQL database. This data consists of parameters and report tags and other batch information such as date and time, phase state, etc. Don't close this display for the remainder of this section. Its display properties are set for cache after displaying, always running always updating, this keeps the batch data updating even when the display is not visible.



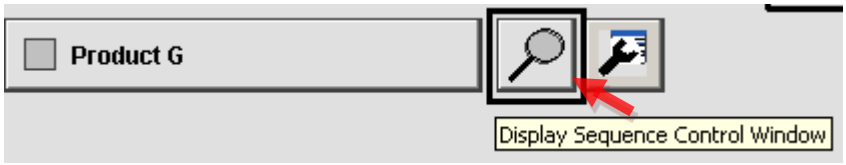
5. The ***Click Here to ABORT Report Generation*** button will close and uncache the Report Generator display and stop archiving the batch data.

6. The final button on the "Premix Tank Unit Configuration" is **Report Viewer**

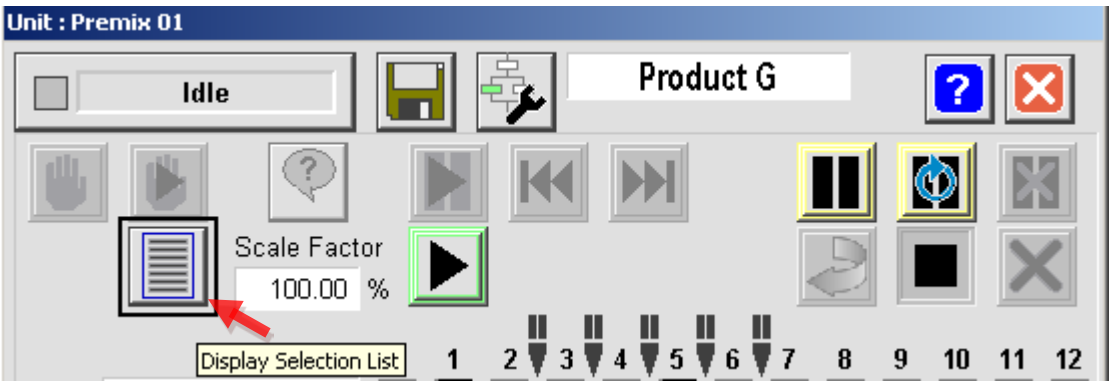
. Selecting this button brings up a display that can be used to look at the XML file version of the batch reports. These XML files are stored in the **Report Location** you see at the top of display. Selecting a file name on the left will display the report in a Webbrowser control on the right.

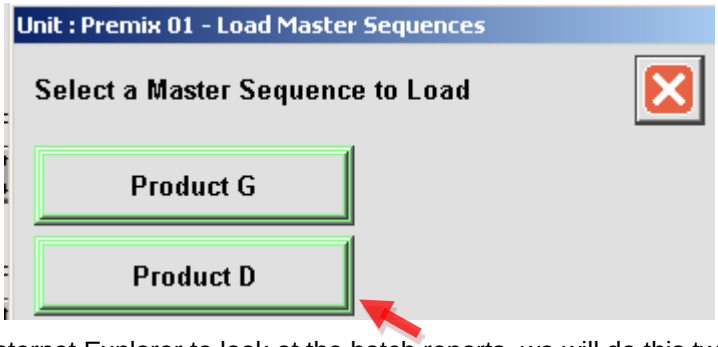


7. Go back to the FactoryTalk View client Premix 1 display and select the ***Display Sequence Control Window*** button.



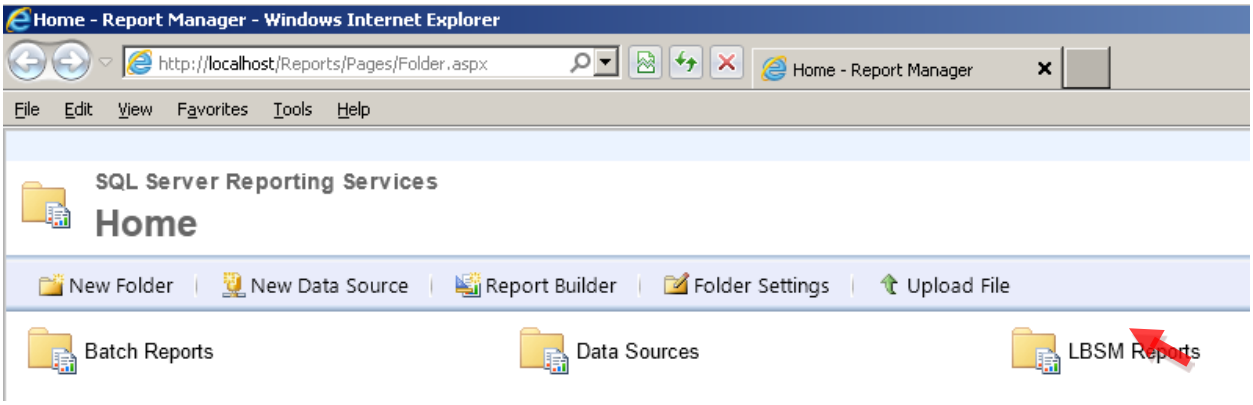
8. From the **Run-time Sequence** window select ***Display Selection List*** and select Product D and run two batches.





9. Now we will use Internet Explorer to look at the batch reports, we will do this two ways first using Windows Internet Explorer, then using a display in FactoryTalk ViewSE containing the Microsoft Webbrowser control. Start ***Internet Explorer***, the home page is set for the report page. Select ***LBSM Reports*** to display the reports.

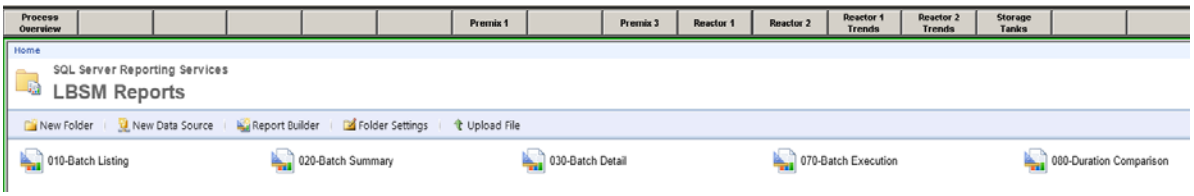
> LBSM Reporting requires the installation of Batch Reporting, which is why Batch Reports is listed on web page. FactoryTalk Batch and LBSM can log data to the same underlying database, but for the lab we have keep the two separate, the FactoryTalk Batch report is on the database on the AppSerBatch VMware image.



> **NOTE:** It may take a couple of minutes to get all the services loaded and running.

10. The second way to look at the reports is to create a display containing the Microsoft Webbrowser control pointed to the report page URL. In the FactoryTalk ViewSE project there is such a display. In the upper right on the navigation bar select the ***LBSM Reports*** button.

11. The LBSM Reports display appears with the five LBSM reports.



Report Query Header

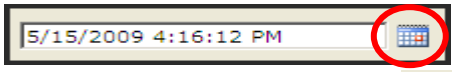
Before we look at the reports let's first get familiar with the query capability of the report system. Each report uses this similar query method at the top of the report

6. **Start Time/End Time –**

The reporting system first filters all searches based on time. All sub-filter lists (Batch ID, Recipe Name, Process Cell, & Unit Name) are trimmed based on the user selection of time. You should consider "time" to be the master search criteria.

-

"Null" selections are available for both start and end time. These can be used to search from the beginning of time (start time null) or to most recent time (end time null).

- 

Standard Microsoft Reporting Services Date/Time syntax is used. Selecting the ***Calendar*** icon allows you to search in more detail or simply type date and/or time into the box. The minimum data required is the date.

7. **Batch ID Filter –**

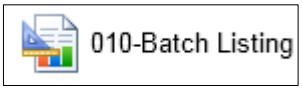
The "Batch ID" is the user defined name given to a batch at runtime. This filter allows the user to trim the query list to those matching the specified text. Expand your filter capability through use of the asterisk (*) wildcard at any point in the filter.

8. **Recipe Name –**

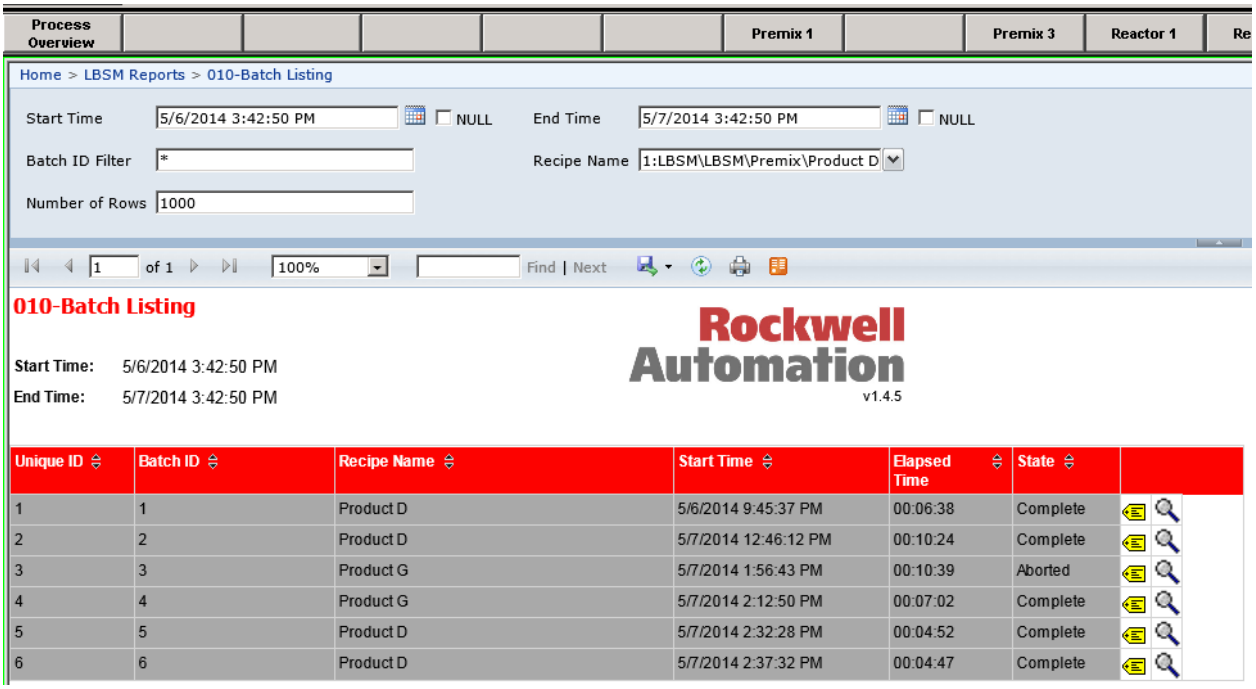
The "Recipe Name" is the name to which the batch recipe is saved. The Recipe Name dropdown list is populated in real-time by listing all recipe names run during the user specified time frame. By default, all items in this drop down are selected. Any individual line items can be selected/un-selected by checking/un-checking the box next to the name. Alternatively, the user can select all/un-select all by checking/un-checking the "select all" check box.

Batch Listing Report

Now that we are familiar with the query header, let's perform our first batch list search.

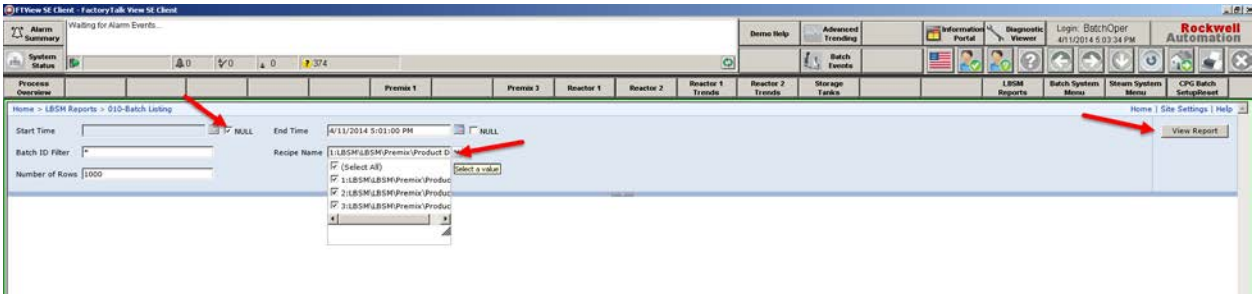
1. Select ***010-BatchListing*** 

2. The report will open with the following query header and the two reports that were just run displayed. Notice that the default Start Time is 24 hours before the current time, hence any batch run in the last 24 hours would be displayed. The screen capture below shows batches run on 7 May 2014.

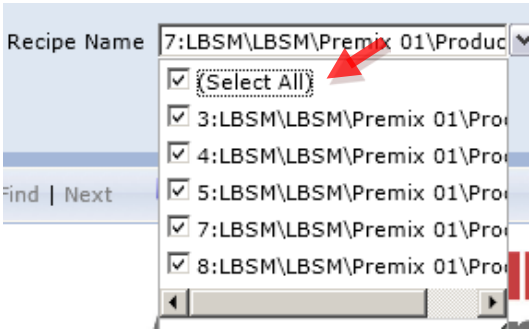


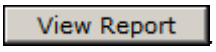
Unique ID	Batch ID	Recipe Name	Start Time	Elapsed Time	State
1	1	Product D	5/6/2014 9:45:37 PM	00:06:38	Complete
2	2	Product D	5/7/2014 12:46:12 PM	00:10:24	Complete
3	3	Product G	5/7/2014 1:56:43 PM	00:10:39	Aborted
4	4	Product G	5/7/2014 2:12:50 PM	00:07:02	Complete
5	5	Product D	5/7/2014 2:32:28 PM	00:04:52	Complete
6	6	Product D	5/7/2014 2:37:32 PM	00:04:47	Complete

3. To see a listing of all the batches in the database select the ***Null*** checkbox to the right of the Start Time.

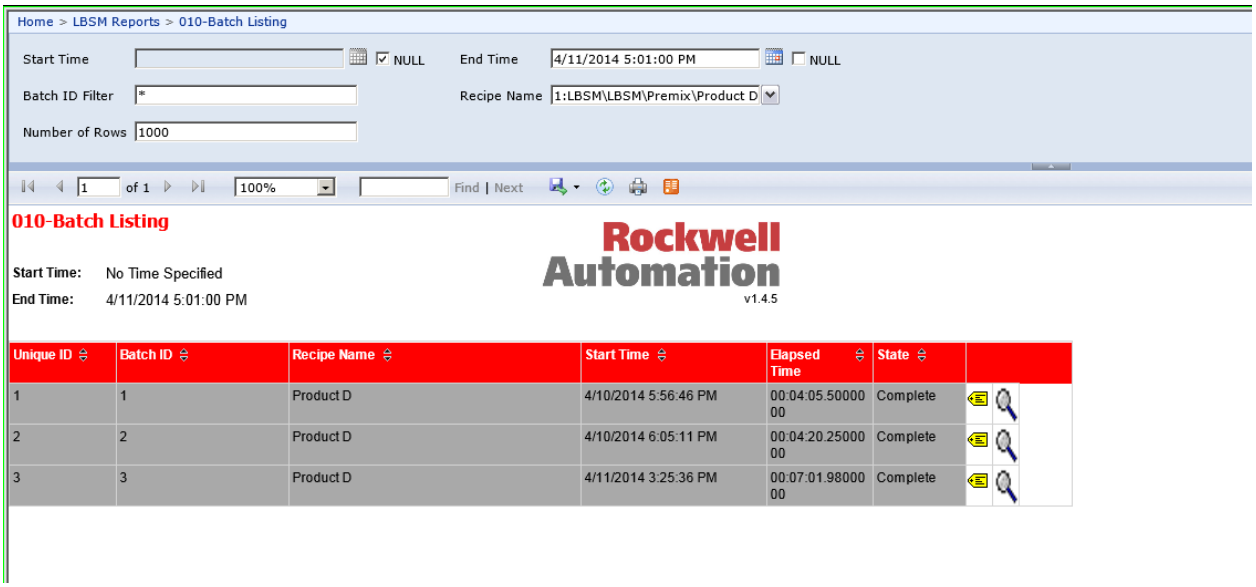


4. . In the ***Recipe Name*** drop down list check the ***Select All*** box.



5. From the top right side of the report, select ***View Report*** 

6. All the batches that have been archived to the database are now displayed.



7. If time allows try filtering the batches by using the ***Start Time Calendar***.

NOTE: As you select dates and complete the Batch ID Filter, the remaining dropdowns are updated to reflect your search criteria.

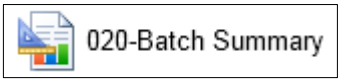
8. Notice that for each line item, a set of two "hotlink" icons are shown. These enable quick navigation to other reports that keep you in context of the specific "Unique ID" (unique identifier for each batch.) of that line. As their names indicate the **Batch Summary Report** icon will open up the batch summary report for the selected batch and the **Batch Detail Report** icon will open the batch detail report for the selected batch.

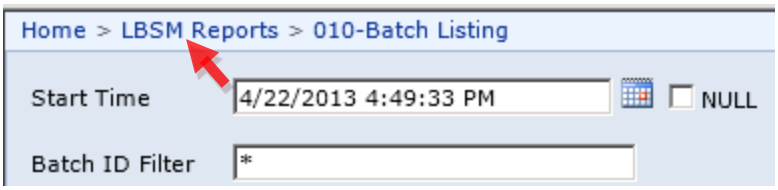
- **Batch Summary Report**

- **Batch Detail Report**

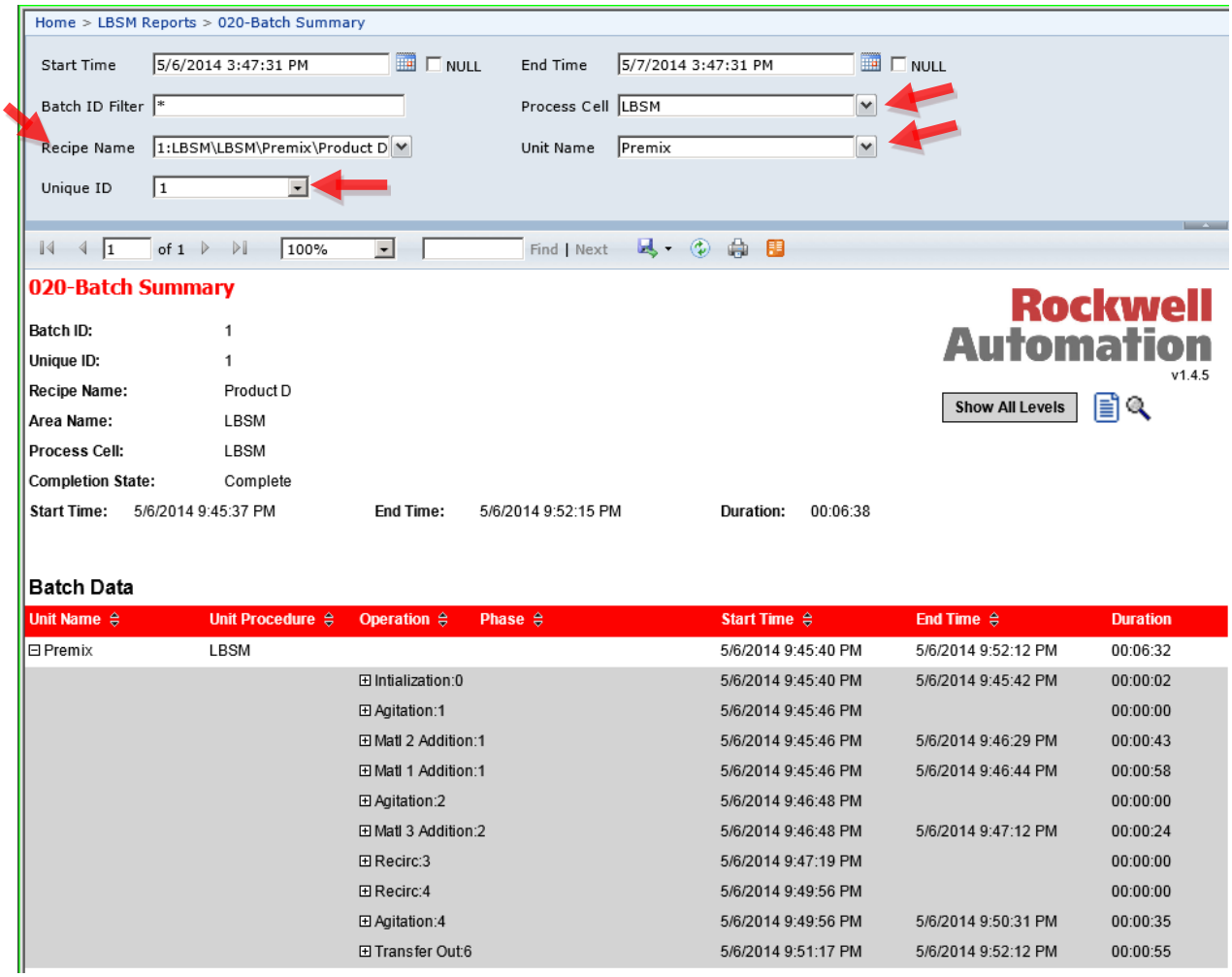
Batch Summary Report

We will use what we have learned to look at the **Batch Summary Report**.

1. Select **LBSM Reports** and then select ***020-Batch Summary*** 



2. The report will open with the following query header shown in the upper part of the display below. Notice that there are several different selection fields from the **Batch Listing** report page; these are **Recipe Name**, **Process Cell**, **Unit Name** and **Unique ID**. In our example we only have one process cell and one unit, if there were more units, like Premix and Reactor units seen earlier then there would be multiple selections for **Unit Name**. The **Recipe Name** selection field is used to narrow down what recipes you want to look at and the **Unique ID** field select the batch to look at.

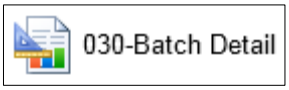


Unit Name	Unit Procedure	Operation	Phase	Start Time	End Time	Duration
⊟ Premix	LBSM			5/6/2014 9:45:40 PM	5/6/2014 9:52:12 PM	00:06:32
		⊞ Intialization:0		5/6/2014 9:45:40 PM	5/6/2014 9:45:42 PM	00:00:02
		⊞ Agitation:1		5/6/2014 9:45:46 PM		00:00:00
		⊞ Matl 2 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:29 PM	00:00:43
		⊞ Matl 1 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:44 PM	00:00:58
		⊞ Agitation:2		5/6/2014 9:46:48 PM		00:00:00
		⊞ Matl 3 Addition:2		5/6/2014 9:46:48 PM	5/6/2014 9:47:12 PM	00:00:24
		⊞ Recirc:3		5/6/2014 9:47:19 PM		00:00:00
		⊞ Recirc:4		5/6/2014 9:49:56 PM		00:00:00
		⊞ Agitation:4		5/6/2014 9:49:56 PM	5/6/2014 9:50:31 PM	00:00:35
		⊞ Transfer Out:6		5/6/2014 9:51:17 PM	5/6/2014 9:52:12 PM	00:00:55

Once the unique id for the batch is selected click on the View Report button and the summary report for the selected batch will be displayed. Clicking on the plus-sign next to the unit name or "**Show All Level**" will expand the data that is shown.

Batch Detail Report

If more detail is require than supplied by the **Batch Summary Report**, the **Batch Detail Report** can supply it.

12. Select **LBSM Reports** and then select ***030-Batch Detail*** 

13. This report will open with the same query header as the **Batch Detail Report**. Selecting a batch to view is done the same way as with the **Batch Detail Report**.

Home > LBSM Reports > 030-Batch Detail

1 of 2 ? 100% Find | Next

030-Batch Detail

Rockwell Automation v1.4.5

Hide All Levels

Batch ID: 1
Unique ID: 1
Recipe Name: Product D
Area Name: LBSM
Process Cell: LBSM
Completion State: Complete
Start Time: 5/6/2014 9:45:37 PM **End Time:** 5/6/2014 9:52:15 PM **Duration:** 00:06:38

Batch Data

Unit Name	Unit Procedure	Operation	Phase	Start Time	End Time	Duration
⊟ Premix	LBSM			5/6/2014 9:45:46 PM	5/6/2014 9:52:12 PM	00:06:26
		⊟ Agitation:1		5/6/2014 9:45:46 PM		00:00:00
			⊟ Agitation:1	5/6/2014 9:45:46 PM		00:00:00
				Recipe Parameter	**Value**	**EU**
				Minutes	0.000	Min
				Mode	Indefinite	
				Seconds	0.000	Sec
				Report Parameter	**Value**	**EU**
				Actual Minutes	0.000	Min
				Actual Seconds	0.000	Sec
		⊟ Matl 2 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:29 PM	00:00:43
			⊟ Matl 2 Addition:1	5/6/2014 9:45:46 PM	5/6/2014 9:46:29 PM	00:00:43
				Recipe Parameter	**Value**	**EU**
				Setpoint	125.000	Kg
				Tolerance	5.000	%
				Report Parameter	**Value**	**EU**
				Actual	128.165	Kg
		⊟ Matl 1 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:44 PM	00:00:58
			⊟ Matl 1 Addition:1	5/6/2014 9:45:46 PM	5/6/2014 9:46:44 PM	00:00:58
				Recipe Parameter	**Value**	**EU**
				Setpoint	200.000	Kg
				Tolerance	5.000	%

14. Once the batch is select and the report appears, clicking on the plus-sign or "**Show All Level**" will expand the data that is shown. This report shows the parameters and reports that were recorded for the batch. The suffixes on the end of the phase names, e.g. Agitation:1, correspond to the recipe's step numbers.

Batch Data

Unit Name	Unit Procedure	Operation	Phase	Start Time	End Time	Duration
⊟ Premix	LBSM			5/6/2014 9:45:46 PM	5/6/2014 9:52:12 PM	00:06:26
		⊟ Agitation:1		5/6/2014 9:45:46 PM		00:00:00
			⊟ Agitation:1	5/6/2014 9:45:46 PM		00:00:00
				Recipe Parameter	**Value**	**EU**
				Minutes	0.000	Min
				Mode	Indefinite	
				Seconds	0.000	Sec
				Report Parameter	**Value**	**EU**
				Actual Minutes	0.000	Min
				Actual Seconds	0.000	Sec
		⊟ Matl 2 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:29 PM	00:00:43
			⊟ Matl 2 Addition:1	5/6/2014 9:45:46 PM	5/6/2014 9:46:29 PM	00:00:43
				Recipe Parameter	**Value**	**EU**
				Setpoint	125.000	Kg
				Tolerance	5.000	%
				Report Parameter	**Value**	**EU**
				Actual	128.165	Kg
		⊟ Matl 1 Addition:1		5/6/2014 9:45:46 PM	5/6/2014 9:46:44 PM	00:00:58
			⊟ Matl 1 Addition:1	5/6/2014 9:45:46 PM	5/6/2014 9:46:44 PM	00:00:58
				Recipe Parameter	**Value**	**EU**
				Setpoint	200.000	Kg
				Tolerance	5.000	%
				Report Parameter	**Value**	**EU**
				Actual	202.805	Kg
		⊟ Agitation:2		5/6/2014 9:46:48 PM		00:00:00
			⊟ Agitation:2	5/6/2014 9:46:48 PM		00:00:00
				Recipe Parameter	**Value**	**EU**

Lab 5: Logix Batch & Sequence Manager

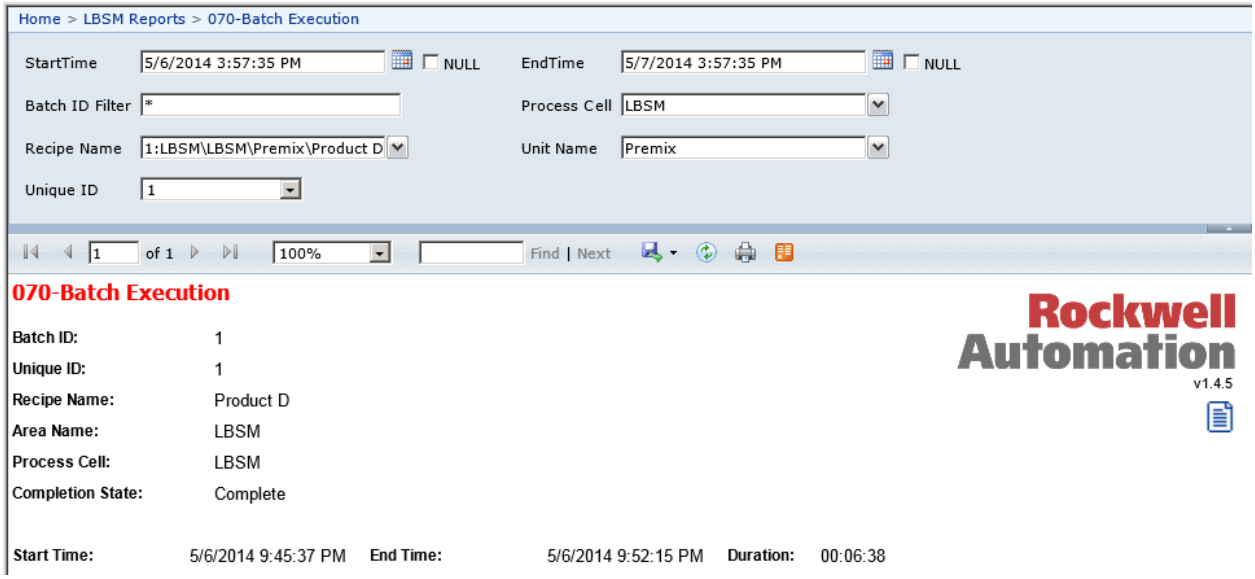
Batch Execution Report

Better understanding the details of batch execution can lead to optimization of cycle time. It can also give a clear picture of what happened during the product run.

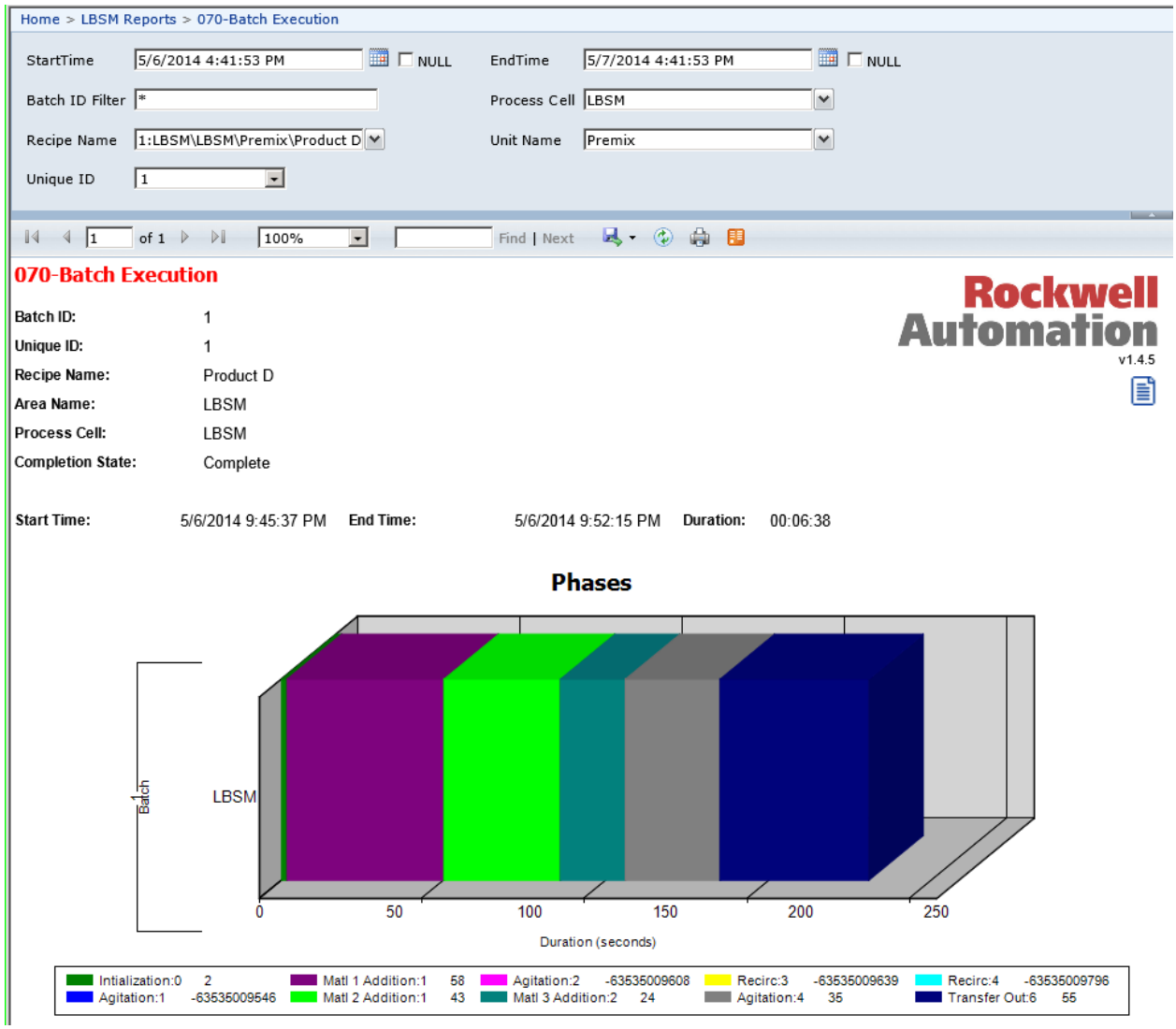
10. Select ***LBSM Reports*** and then select ***070 – Batch Execution***

.

11. This report will open with the now familiar query header. Select a batch as have been done in the earlier steps.

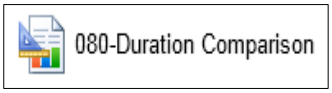


12. As shown below there is a bar graph showing the total time phases, with positive time values, ran in the *Product D* recipe. Notice that there are Agitation phases and the Recirculation phases with a negative time and they don't show up in the bar graph. This is due to the phases being configured as "Indefinite", which results in the phase's endtime being set to "NULL" in the database. The duration time is a simple calculation of "endtime – startime", which for a phase with "NULL" as its "endtime" value produces the large negative number. This will be fixed in a future release.



Batch Duration Comparison Report

The **Batch Duration Report** allows comparison of batch executions time.

10. Select ***LBSM Reports*** and then select ***080 – Duration Comparison*** 

.

11. Using the same steps as above select a date, recipe(s) and unique id(s). Since on this report the execution time of batches is being compare you can select multiple batches. Below show the report with two batches selected. Product D has two manual steps in the recipe; the longer run time of Batch ID 8 was due to taking longer to perform the manual steps.

Unique ID	Batch ID	Start Time	End Time	Duration HH:MM:SS	Duration Total Sec
7	7	4/23/2013 1:31:56 PM	4/23/2013 1:37:19 PM	00:05:23.2470000	323
8	8	4/23/2013 1:37:49 PM	4/23/2013 1:44:19 PM	00:06:29.5000000	390

The Operator's Perspective is now complete!

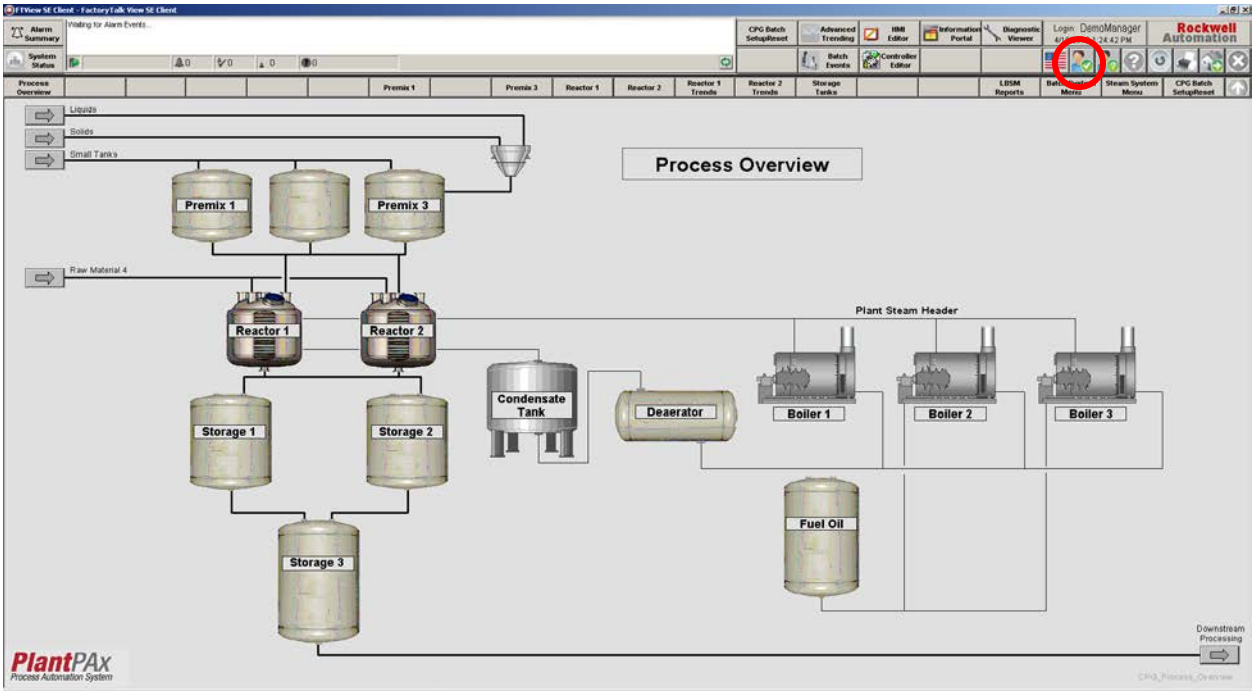
Engineer's Perspective

System modifications may be required over time; therefore, this user perspective will introduce you to a couple of system engineering changes. In this lab, we will modify an existing phase and add a new phase to the system.

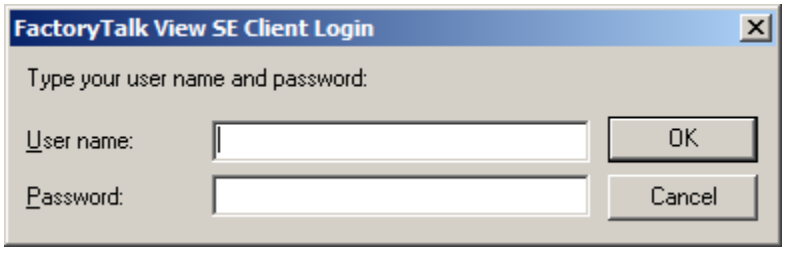
Lab 5: Logix Batch & Sequence Manager

Security & Login

1. From the Overview Display button bar, select the ***Login*** button in the top right hand quadrant of the display.



2. At the log on prompt, ***Log In*** as the Engineer with User ID = '**Engineer'** with the Password = '**Engineer'** and **click *OK***.



Modifying the Configuration for an Existing Phase

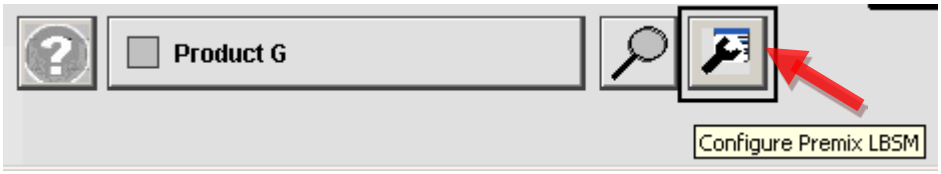
The Requested Equipment Change

In recent research, R&D has found that limiting the rate of material 1 addition to each sequence will improve the quality of the product. They have made this change request to engineering.

Engineering can easily accommodate this request by adding a new sequence parameter called “Flow Rate” in KG/Sec for the material 1 addition phase. Let’s take a look at how we can update LBSM.

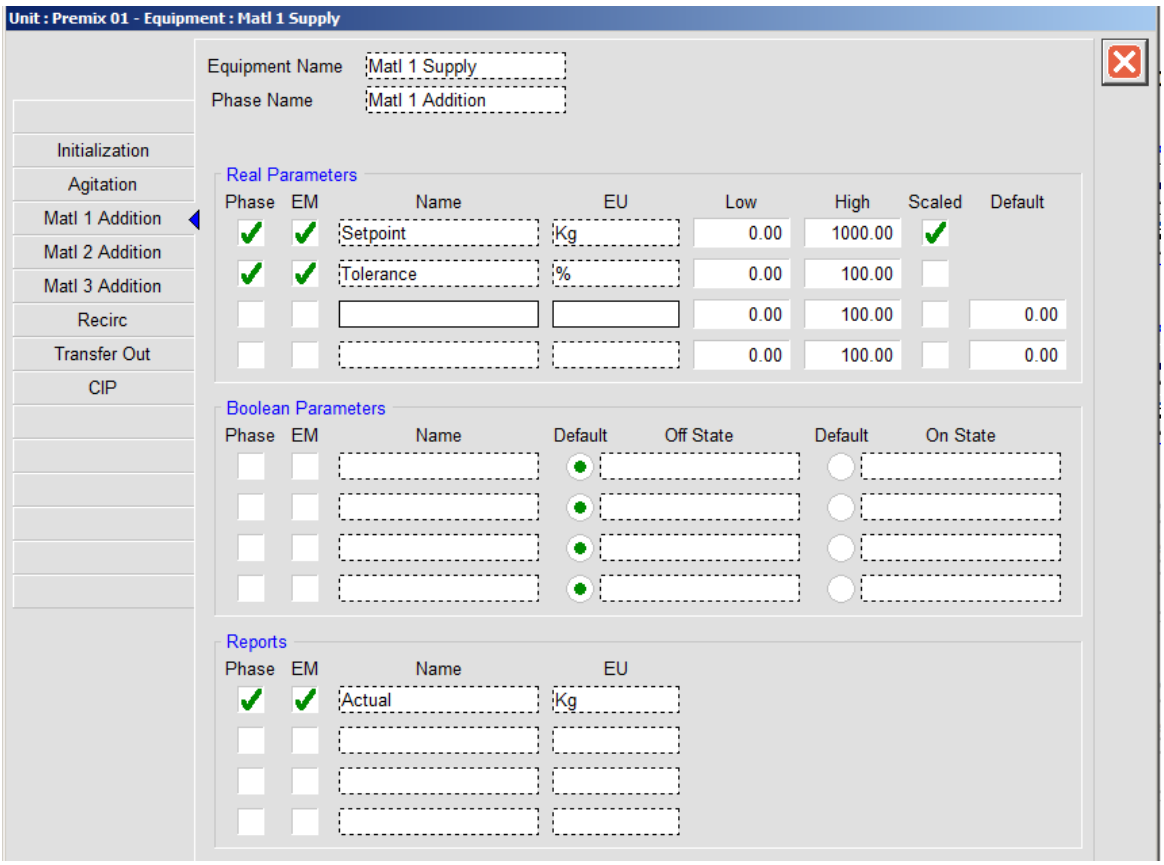
---

1. LBSM phase configuration is performed from the Engineering HMI display. From the “Premix 1,” display selects “**Configure Premix LBSM**”.

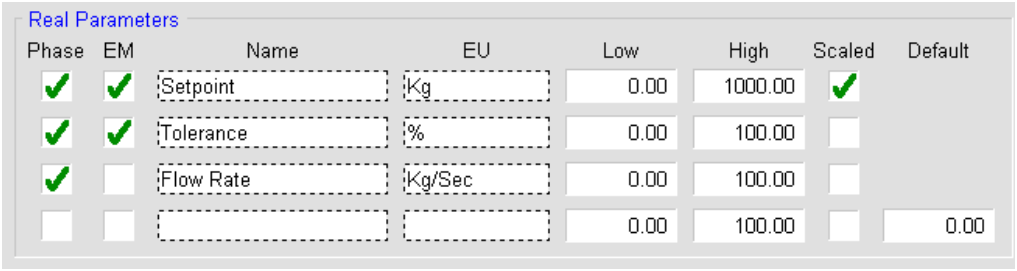


Select the “***Wrench and Motor***” on the “***Premix Tank Unit Configuration***” popup to display the “Equipment Configuration Window.

2. Once on the “Engineering” screen select a phase to modify. Suppose it has been determined that product consistency is improved when the rate, at which Matl 1 is added, is specified as a sequence parameter. Select ***MATL 1 ADDITION*** from the phase listing to display the “Phase Configuration” screen.



3. First, check phase (for phase parameters) in the third, available, real parameter location. Add the parameter ***‘FLOW RATE’*** to the phase. Press ***ENTER***. Tab over and enter ***‘Kg/Sec’*** for the engineering units. Press ***ENTER***. Leave the “Scaled” box unchecked, since the same flow rate would be used, regardless of sequence size.



We have now completed this LBSM configuration change for R&D. Keep in mind that additional control code would also need to be added into the system, but the lab will not cover that change.

Configuring a New Phase

The Requested Equipment Change

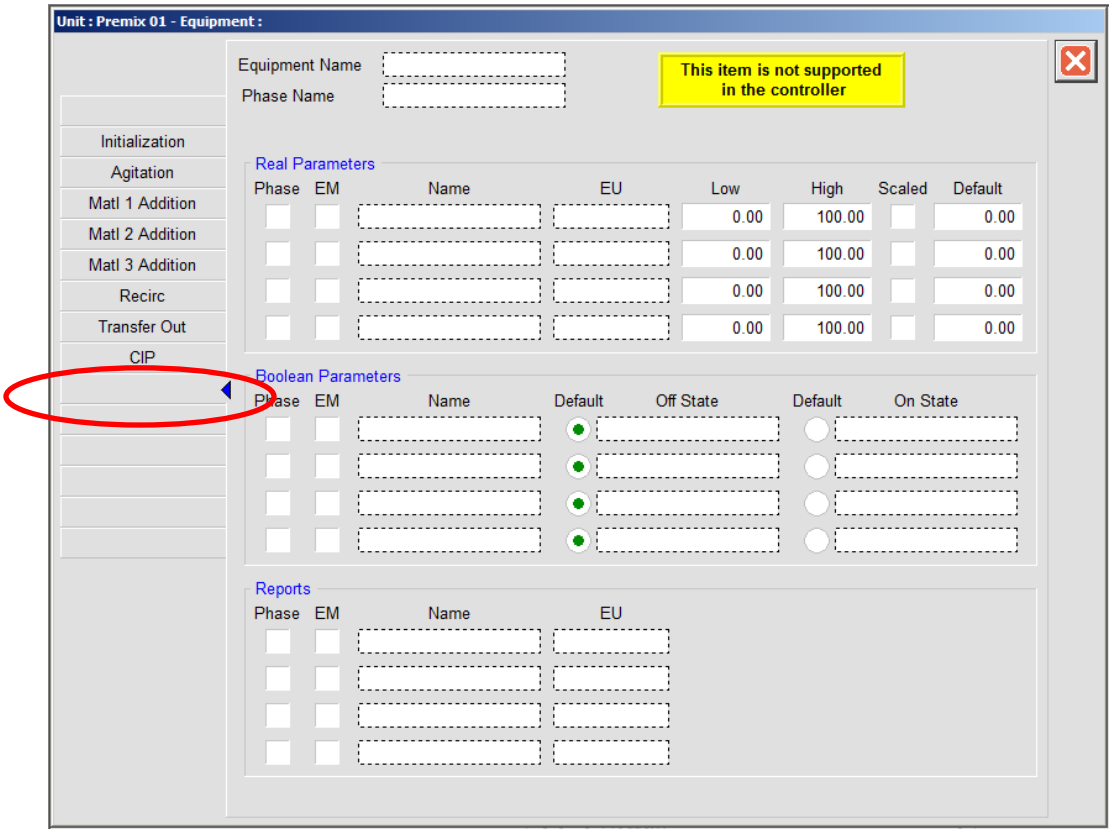
The Quality department has requested that all products running on Premix_01 take advantage of the newly installed “Steam in Place” (SIP) system. This ensures a quality product.

Engineering has developed standard SIP phase logic, and would now like to add this functionality into the LBSM system. Let’s take a look at how we can update the LBSM equipment configuration

---

1. Continuing from above, “SIP” now needs to be configured in LBSM, thus making a SIP phase available for use in sequence configuration.

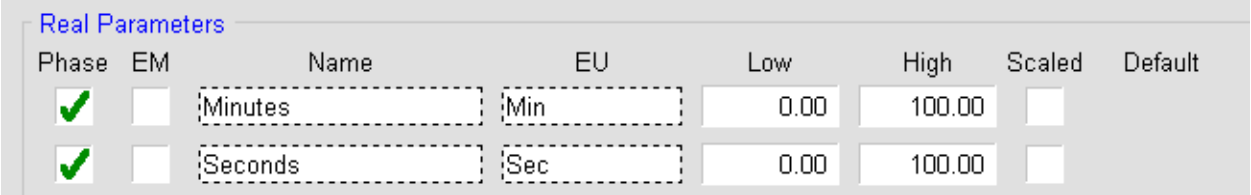
2. From the Premix_01 equipment configuration screen, ***Select the next open box, below the existing “CIP” phase***.



3. Type ***'STERILIZER'*** for Equipment Name. Type ***'SIP'*** for Phase Name. Press ***PAGE DOWN*** to save both entries. ("Page Down" is an alternative to pressing "Enter" after each entry. Page Down downloads all information on the screen.)

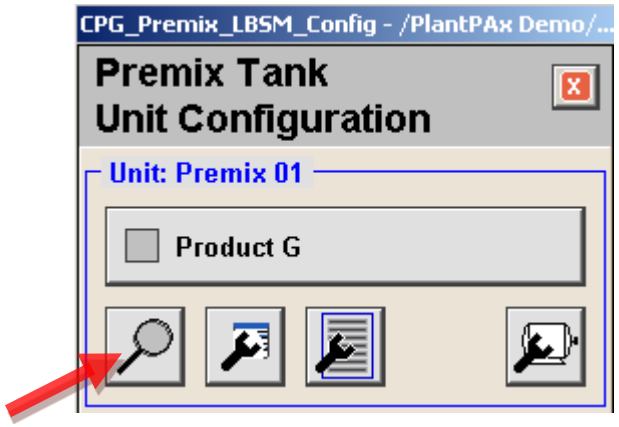
4. Under "Real Parameters" configuration, Check ***PHASE*** and add ***'MINUTES'*** for the "Parameter Name." Continue by entering ***'MIN'*** for the Engineering Units (EU). Press ***PAGE DOWN***.

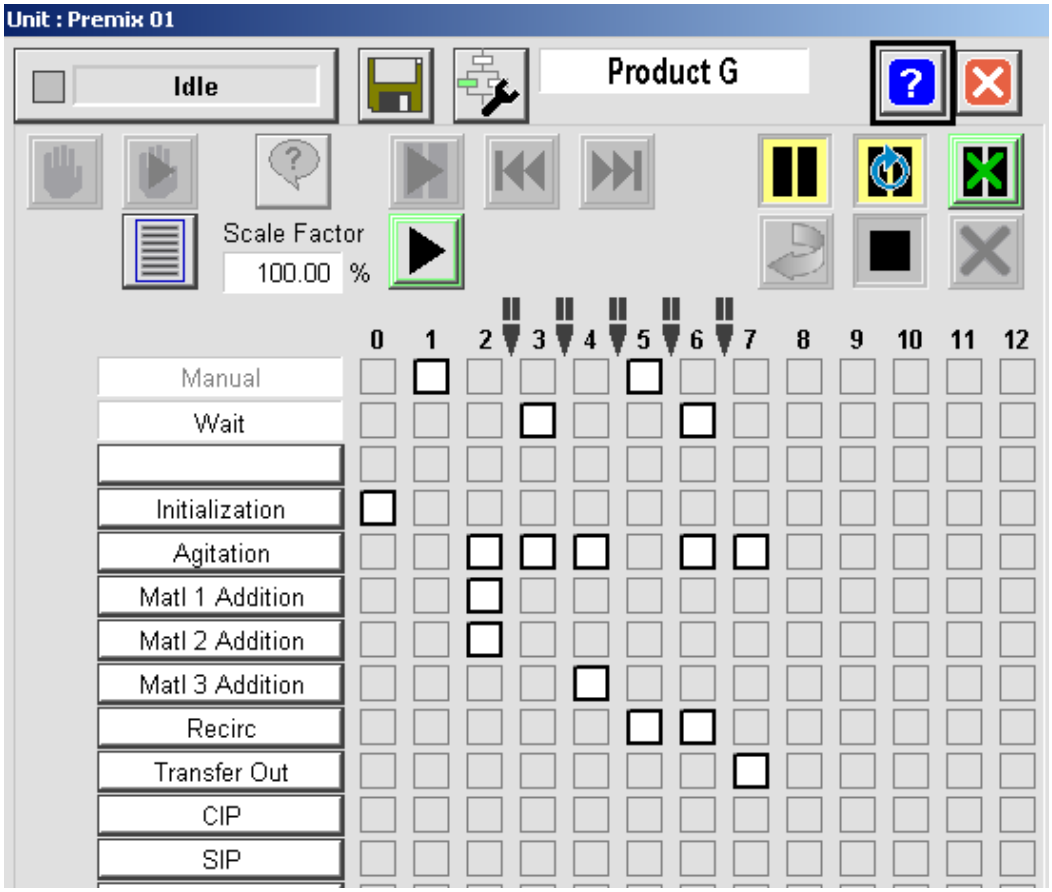
5. Check ***PHASE*** and add ***'SECONDS'*** for the "Parameter Name." Continue by entering ***'SEC'*** for the Engineering Units (EU). Press ***PAGE DOWN***.



6. We have now added the new configuration for SIP and have included two setpoints for time delay on the step. Close the configuration window by clicking on the red '***X.***' .

7. Click on the ***Run-Time Sequence Window*** button.





Notice that SIP is now included in the listing of phases.

Lab 5: Logix Batch & Sequence Manager

You have successfully configured a new piece of equipment in LBSM. Now we will connect it to the controller code that runs the equipment.

Connecting LBSM to the Controller Code

LBSM interfaces to user developed logic, in an automation controller (e.g. CLX), through a defined data structure. The application logic can be written with or without the use of the PhaseManager instruction set.

This demo application uses the PhaseManager interface so that the same phase can easily be managed with either a FTB (FactoryTalk Batch) or a LBSM (Logix Batch and Sequence Manager) system.

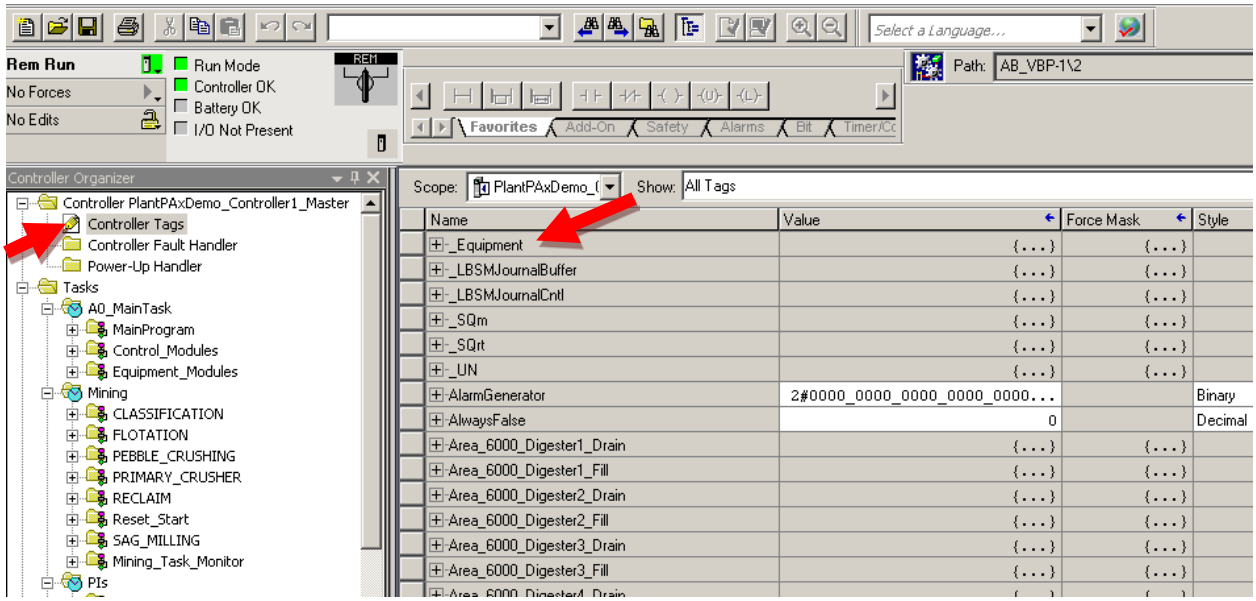
Coding phases is beyond the scope of this session, but we will look at the interface and data structures then import a pre-developed SIP Phase.

1. Open the previously minimized ***PlantPAxDemo_Batch_Controller1_2_3_2014.ACD*** RSLogix 5000 project.

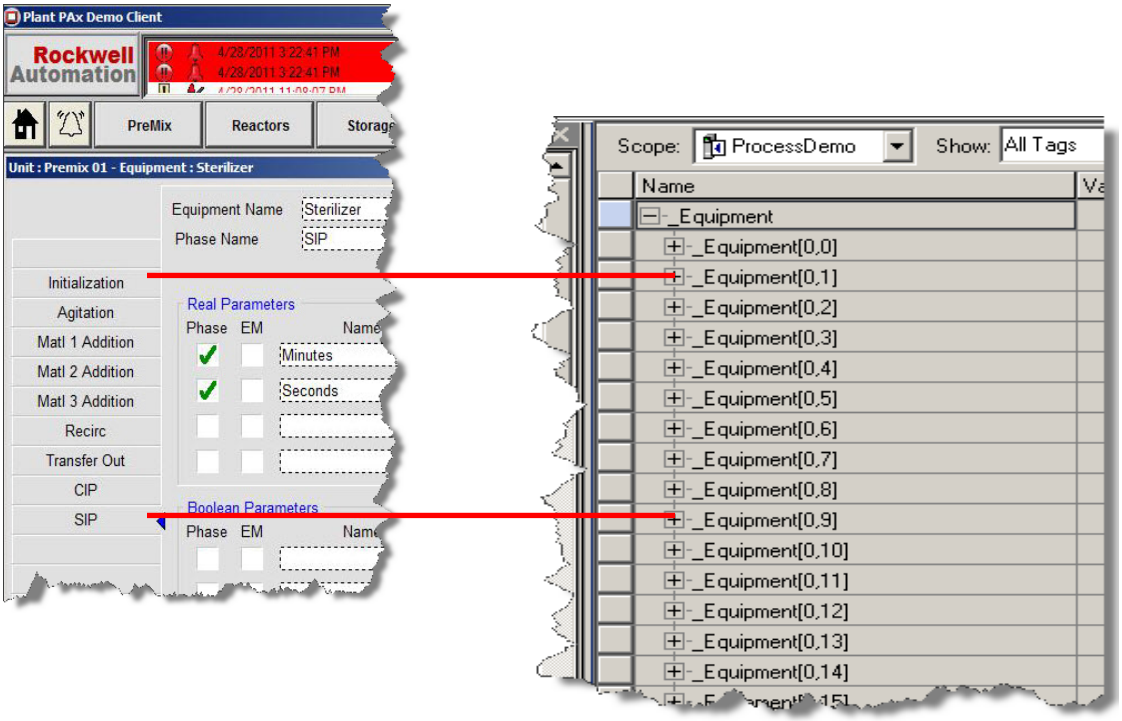
NOTE: Each of the following activities will be done to the online running controller. There is no need to shut your process down to make these connection to LBSM.

2. Coding phases is beyond the scope of this session, but we will look at the interface and data structures then import

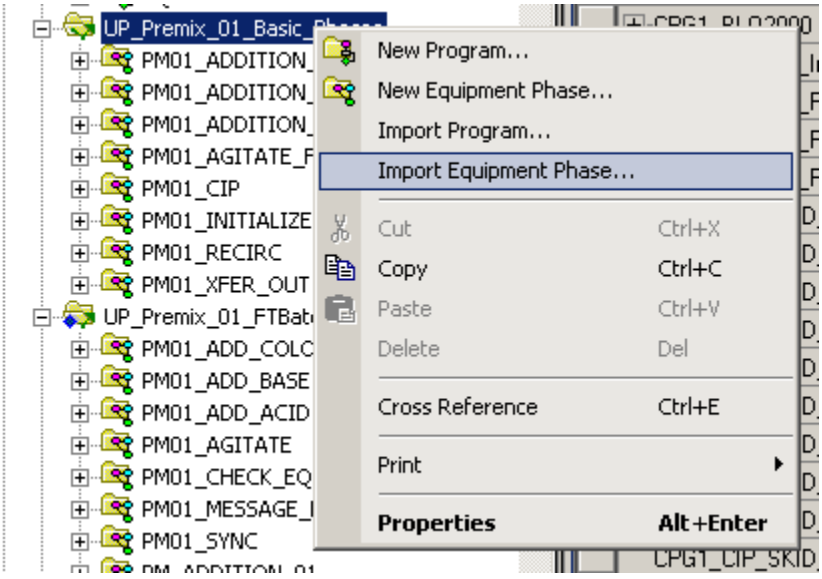
3. Select ***Controller Tags*** and scroll down to the ***_Equipment*** tag.



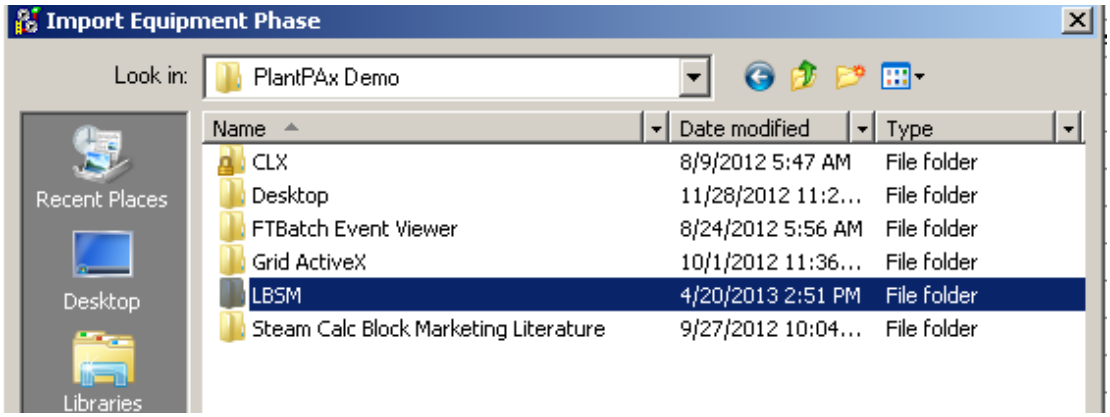
4. Expand the ***_Equipment*** tag and note this is an array. Each member of the array aligns with a position on the "Phase Configuration" display. For example, the phase "Matl 1 Addition" phase aligns with EquipmentPhase[3] and the "SIP" phase you created above aligns with EquipmentPhase[9]

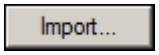


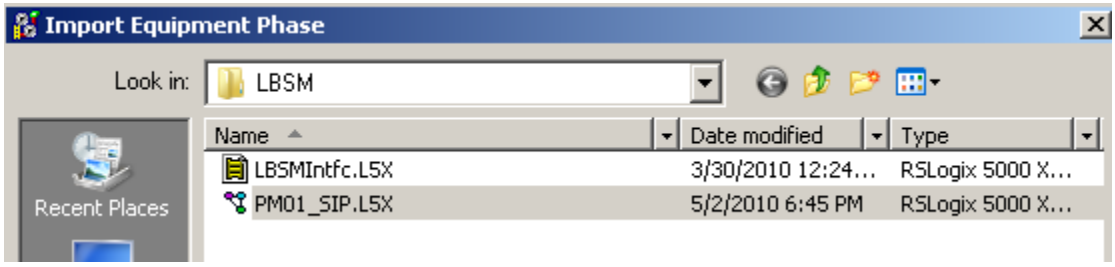
5. Now let's import a pre-developed SIP phase. Right-Click on "**UP_PREMIX_01_Basic_Phases",** and select "**Import Equipment Phase".**



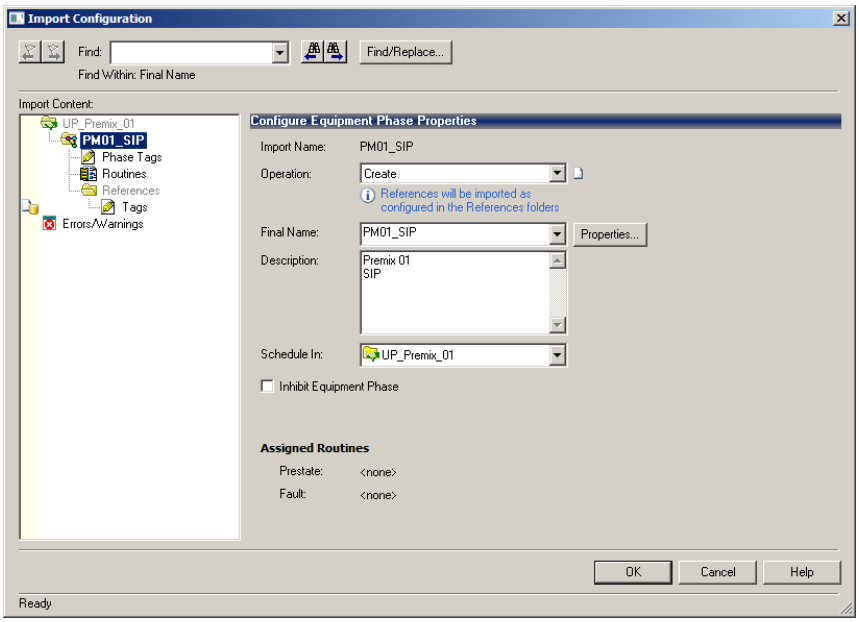
6. Browse to the "**C:\PlantPAx Demo\LBSM"** folder.



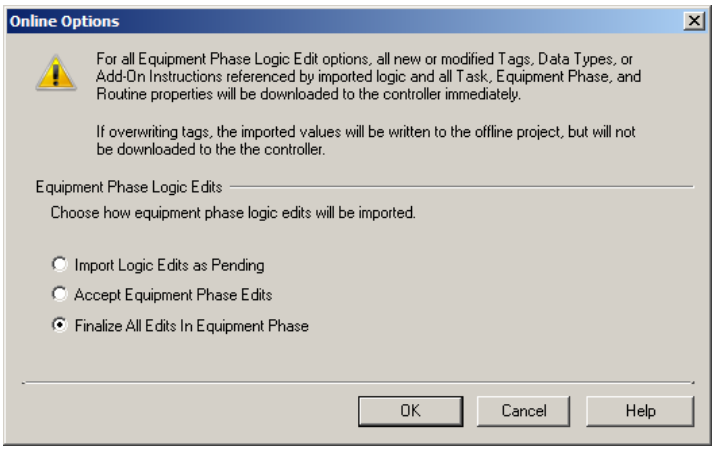
7. Select the "**PM01_SIP.L5X"** import file, and then click the  button



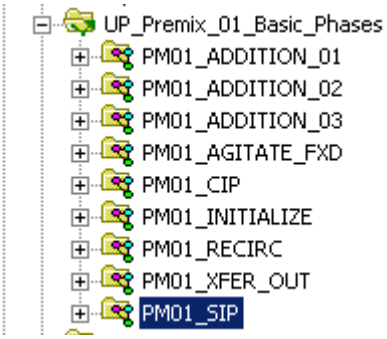
8. On the import screen, leave the default values and click OK.



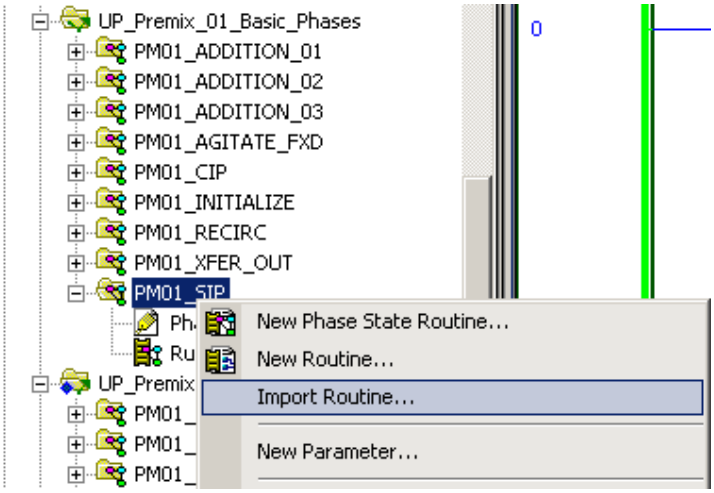
9. When prompted, Select "**Finalize all edits in Equipment Phase",** then select OK.



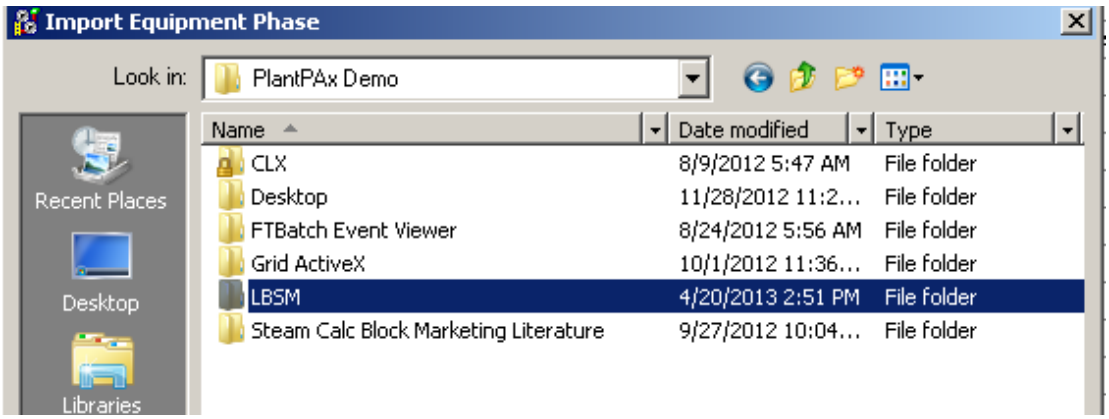
10. The new SIP phase will be added into the project tree.

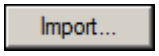


11. When PhaseManager is used, an interface routine is added to each PhaseManager program. This interface routine translates general LBSM commands to PhaseManager commands. Now let's import this interface routine. Right-Click on the "**PM01_SIP"** routine and select "**Import Routine".**



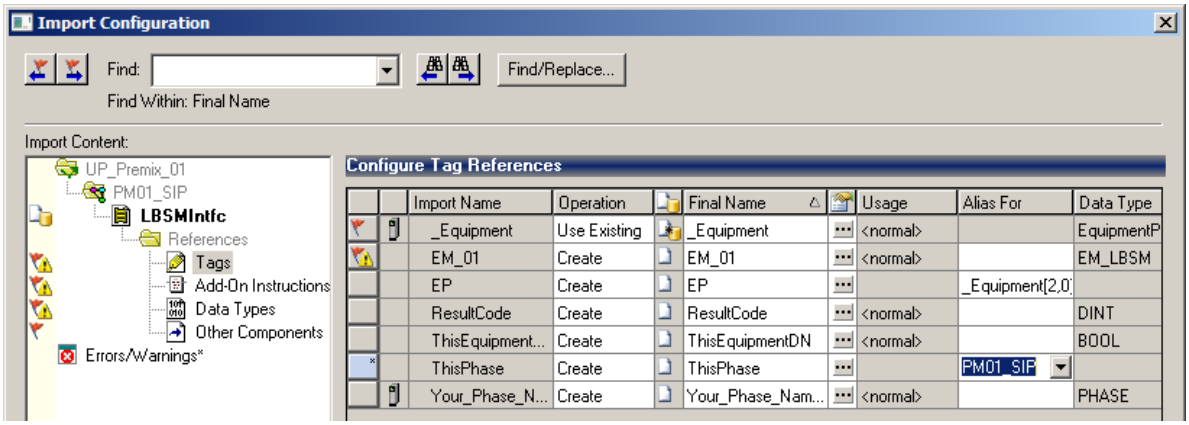
12. Browse to the "**C:\PlantPAx Demo\LBSM"** folder.



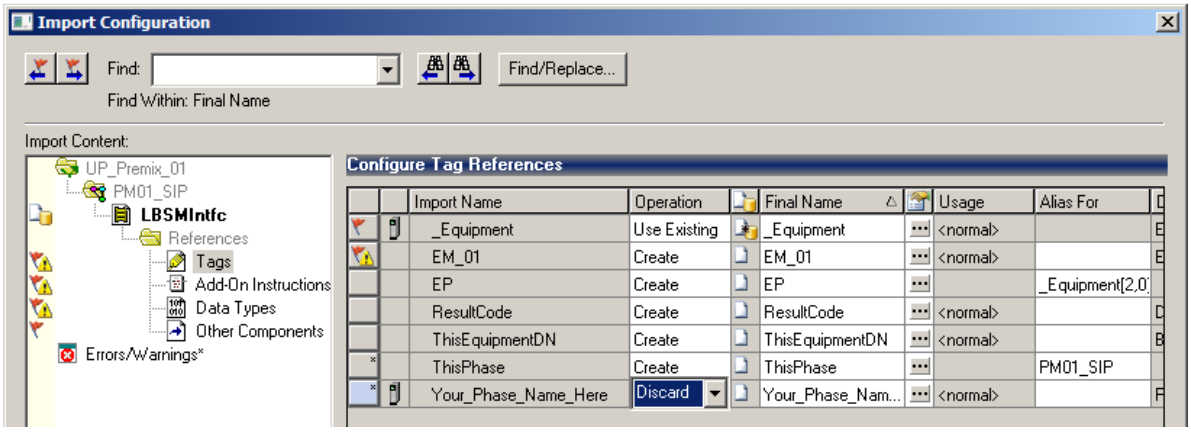
13. Select the "**LBSMIntfc.L5X"** import file, and then click the  button

14. In the Import Configuration dialog box, select Tags.

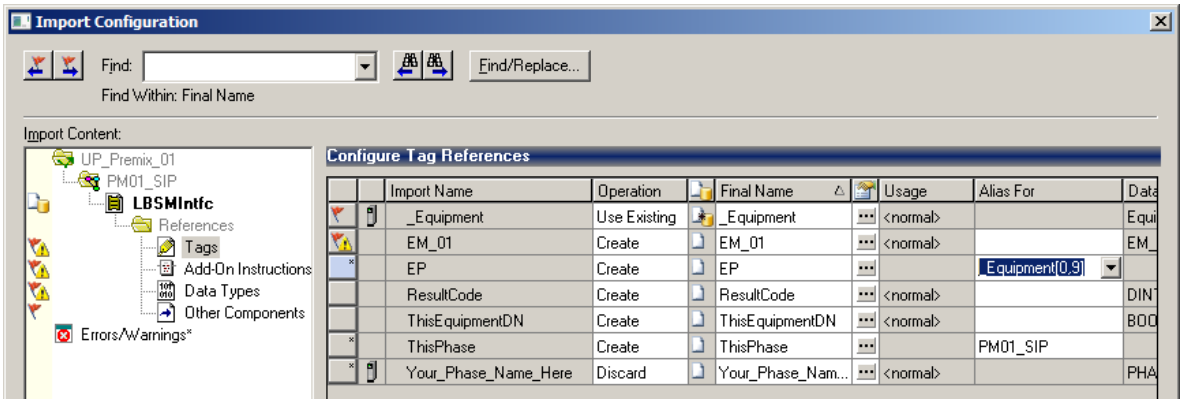
15. Change the alias for "ThisPhase" to "**PM01_SIP"**



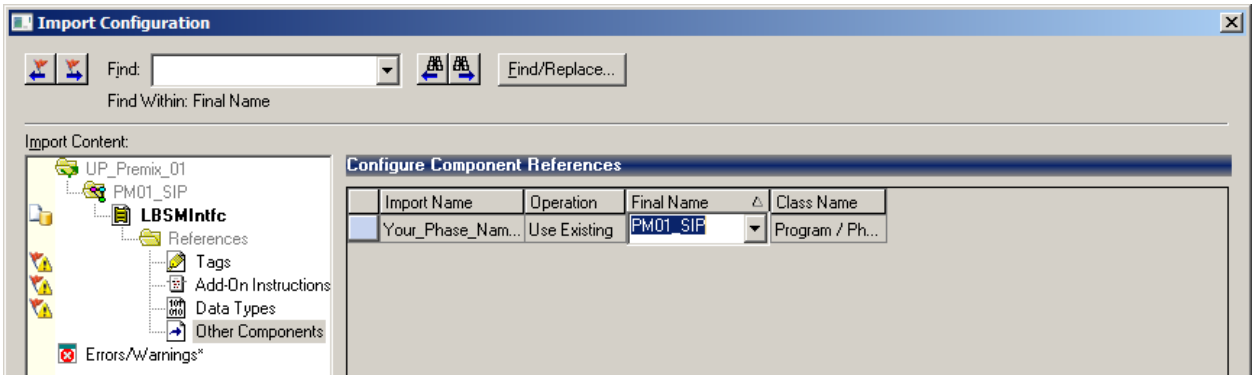
16. From the "Your_Phase_Name_Here" Operation pull-down menu, choose **Discard**.



17. We will now assign the Premix_01 SIP phase pointer. This is the primary way LBSM connects to this specific PhaseManager phase. Therefore, from the EP Alias For pull-down menu, Select "**_Equipment[0,9]"** from the list. (Remember SIP was assigned to the 9th equipment position in the previous section when the SIP phase was configured in LBSM.)

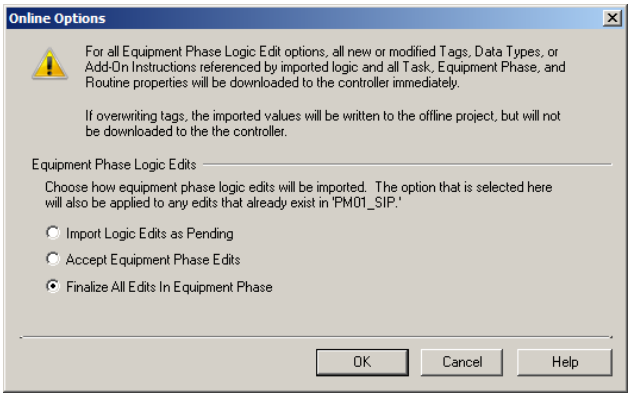


18. Select "Other Components" and replace the "Final Name" with "**PM01_SIP"**

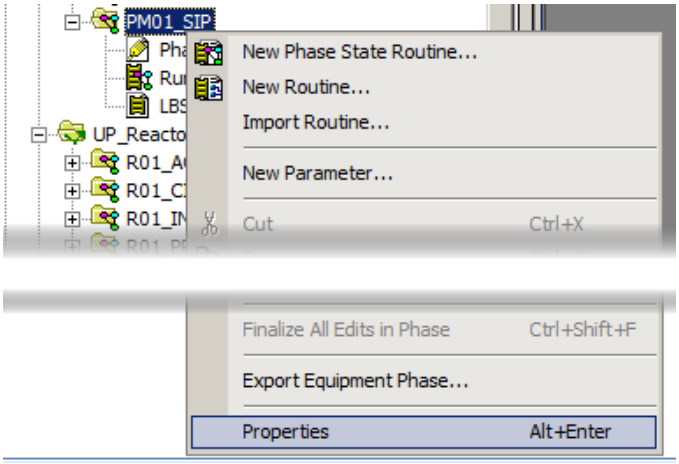


19. Click OK to import the configuration.

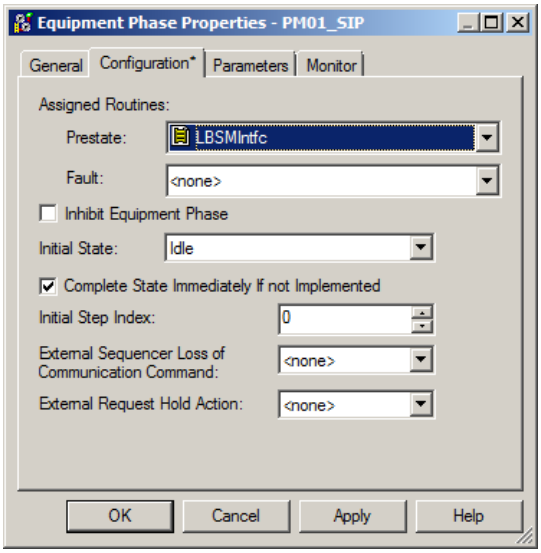
20. When prompted, Select "**Finalize all edits in Equipment Phase",** then select OK.



21. When the interface routine successfully imports, right-click on the **PM01_SIP** phase and select "**Properties".**



22. Under the Configuration tab, Use the dropdown to set “**LBSMIntfc”** as the Prestate routine, and Select OK.

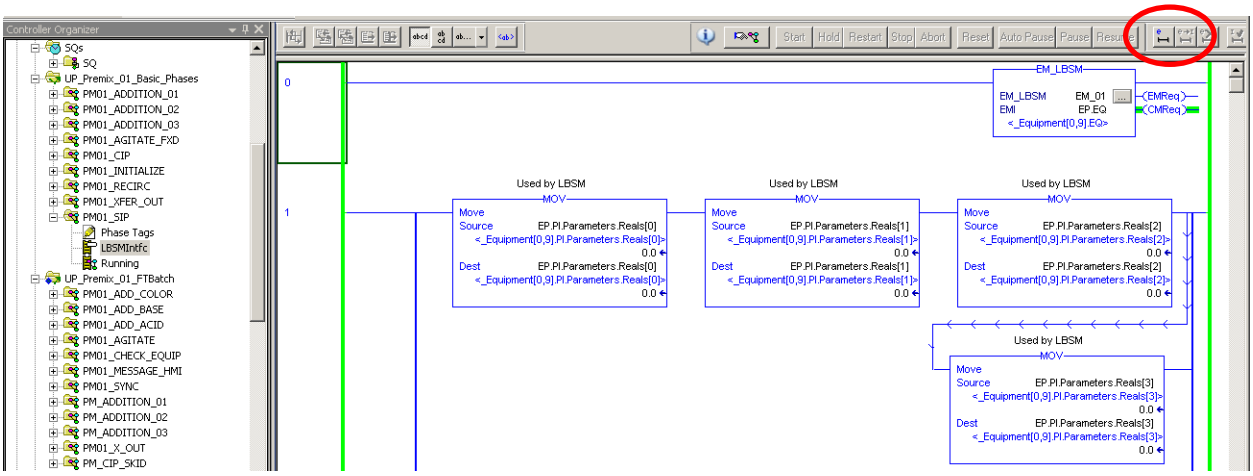


You have now successfully linked the LBSM engine to this specific PM01_SIP PhaseManager phase.

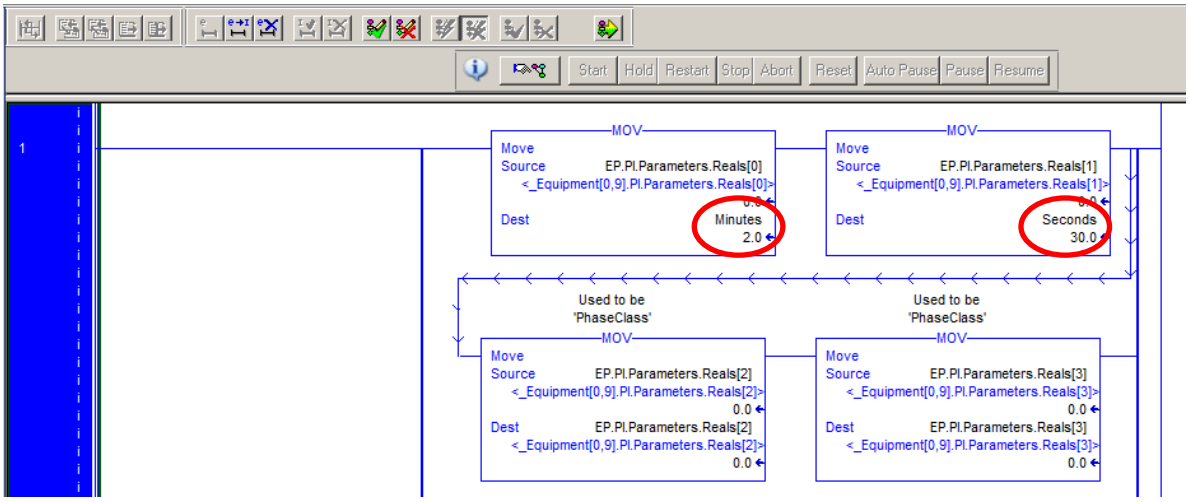
In an earlier section we defined 2 input parameters for the SIP phase, Minutes & Seconds. We need to now map these values into the PhaseManager phase.

23. Double-click the **“LBSM_Intfc”** routine under the “PM01_SIP” phase to open the routine.

24. Select the **second rung** as shown in the picture below, and then click the “**Start Pending Rung Edits**” from the toolbar.

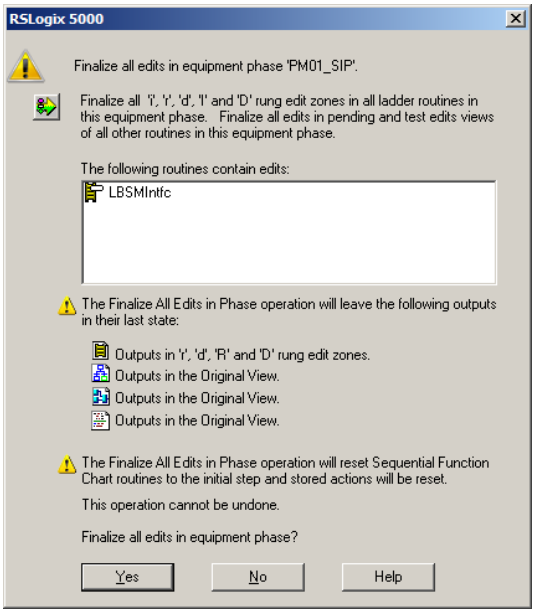


25. Change the Destination tag address of the first move instruction to “**Minutes”** and change the destination tag address of the second move instruction to “**Seconds”**



26. Select “**Finalize all edits in the Equipment Phase”** from the toolbar.

27. When prompted, select **YES** to complete the edit.



You have now successfully mapped the input parameters from LBSM to the PM01_SIP PhaseManager inputs.

The Engineer’s Perspective is now complete!

R&D (Recipe Author) Perspective

The goal of an ISA88 based batch management & control system is to separate the sequence from the equipment. This user perspective will demonstrate how you as a recipe author can create and edit sequences (both procedure and formula) independent of the plant floor equipment.

The Requested Sequence Changes

1. Lab tests have shown that we can maintain product quality while reducing cost by adding less of Matl 1.
2. Testing has also shown that less separation occurs, if we continue to circulate the tank's contents while the operator is taking a sample.
3. Next, we can eliminate a build-up issue if Matl 3 is added in two stages rather than all at once, as is currently done.
4. Finally, we will add the SIP step into the product sequence to satisfy the new request from the quality department.

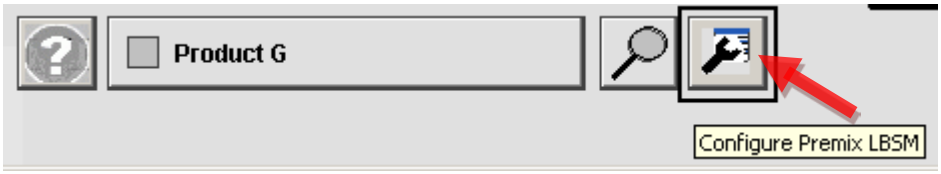
We will be making these procedural and formula changes next, using the LBSM Sequence Editor.

LBSM Sequence Editor

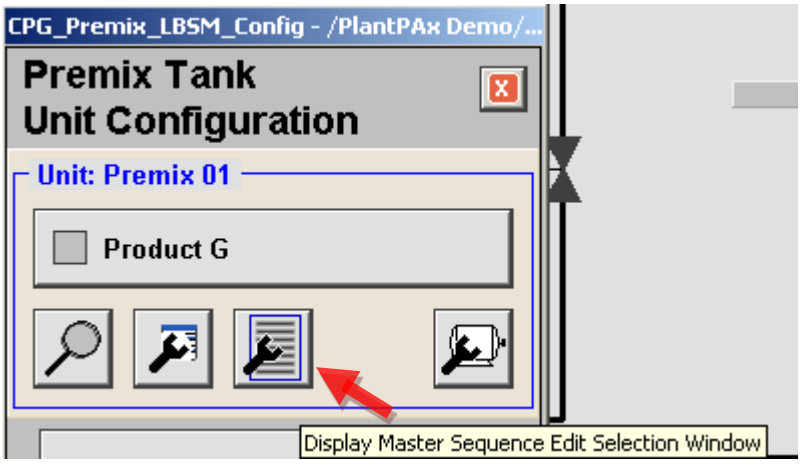
The LBSM Sequence Editor is used to create and configure sequences. All configurations are performed from a HMI client display. In LBSM, the user can create/edit either a master sequence for the unit or edit sequence already loaded into the unit.

Navigate to the Sequence Editor

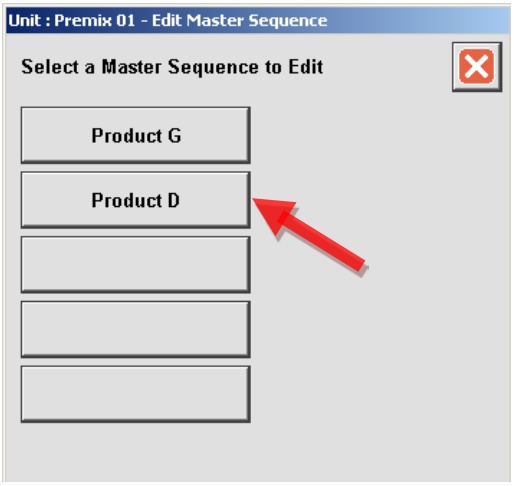
1. LBSM recipe configuration is performed from the Engineering HMI display. From the "Premix 1," display selects "**Configure Premix LBSM**".



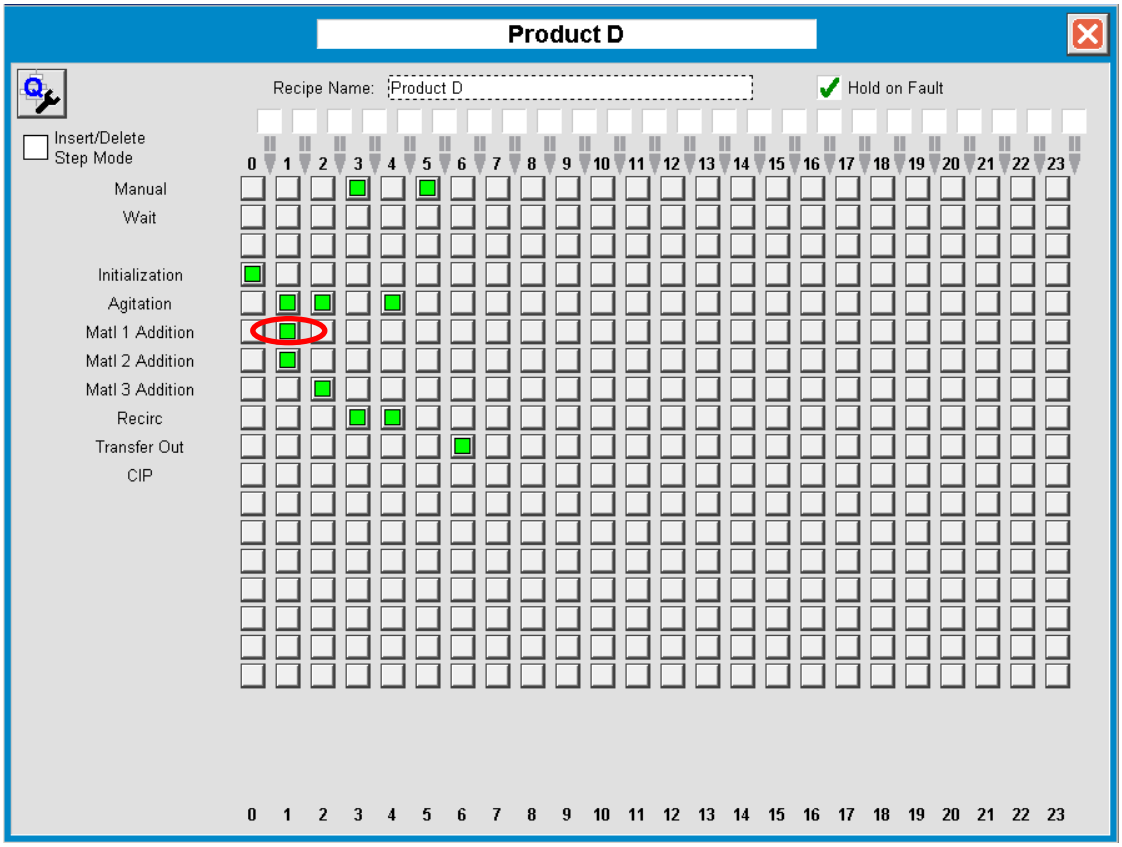
2. The LBSM “Sequence Management” display appears.



3. Select the “**Display Master Sequence Edit Selection Window”** button under Premix 01. When the popup opens, select ***Product D***, by clicking on the appropriate button.

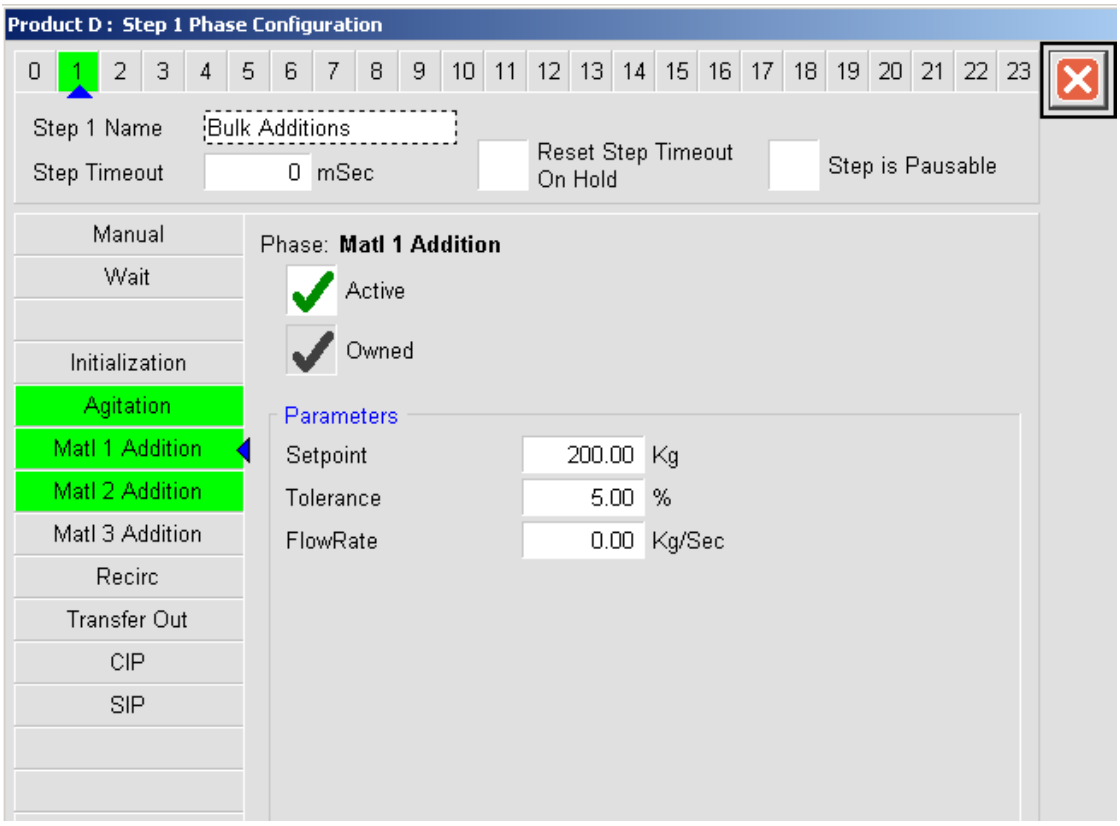


4. Now, let's make the desired set-point adjustment for the "Matl 1 Addition" in Step 1. Begin by ***clicking on the green box at the intersection of Step 1 and Matl 1 Addition***.



The sequence display shows "steps" on the horizontal axis and "phases" on the vertical axis. A green box, at any intersection of step/phase, indicates that the phase will execute in that step.

The “Step Edit” screen opens.



Take a moment and familiarize yourself with this screen.

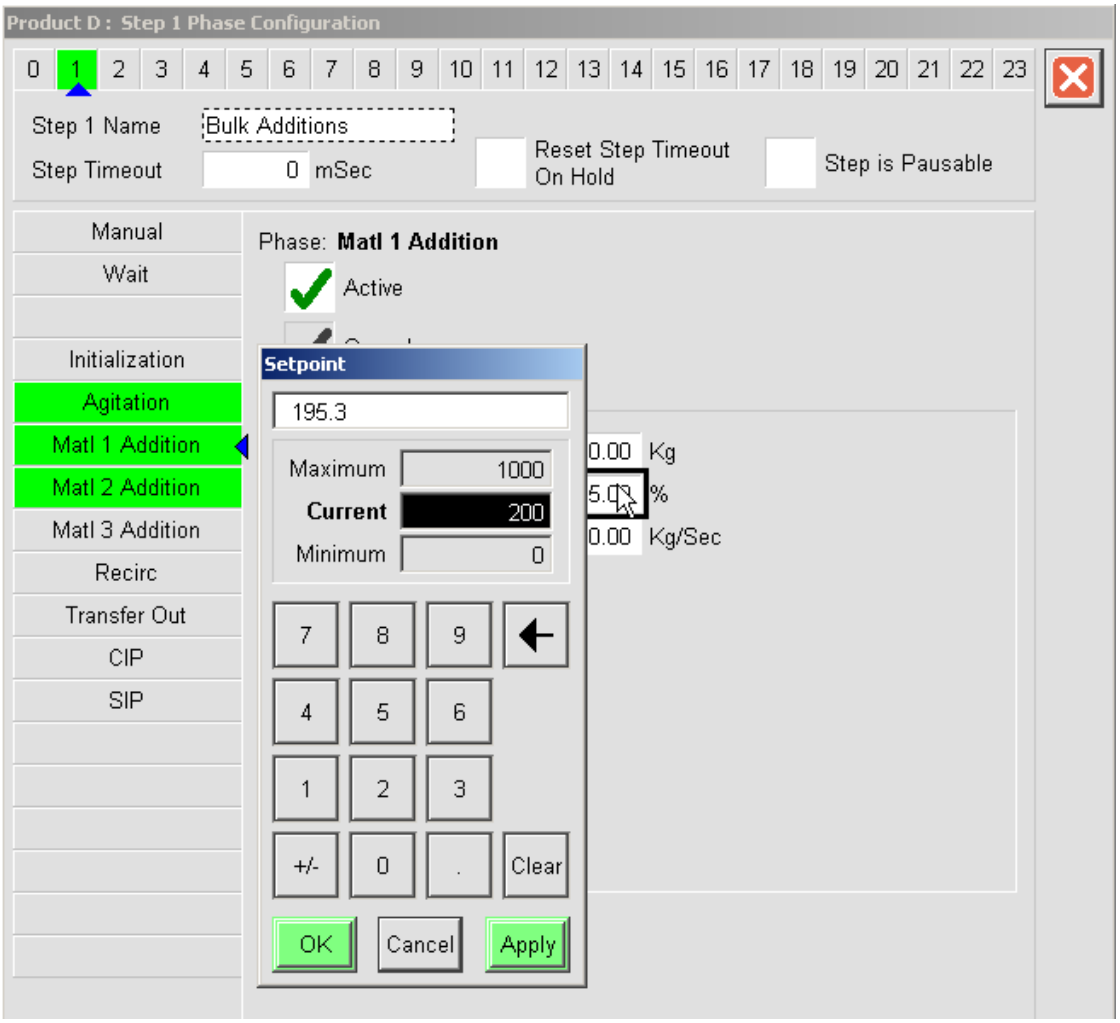
The blue triangle, on the top row, indicates the step currently being edited, in this case “Step 1.” Highlighted green phases are those phases that are executed in this step.

The blue triangle on the left hand side points to the phase being configured. Highlighted green step numbers above, indicate all steps that have the selected phase configured in them.

The top data box is the step configuration window. This allows the user to name each step, assign timeouts and fault propagation, and enables a pause point.

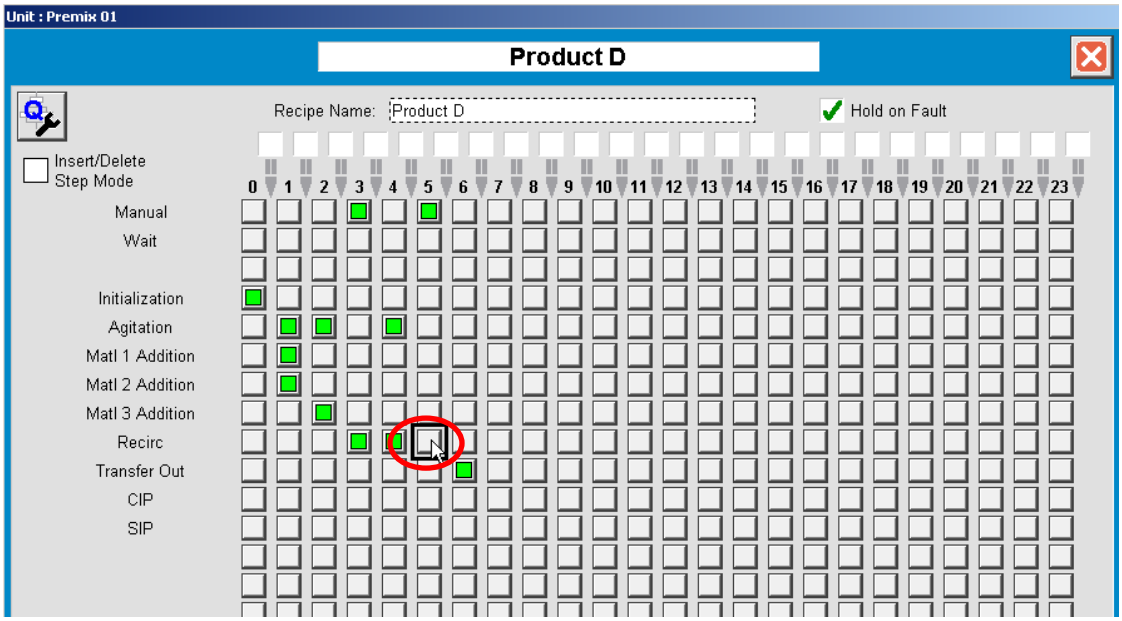
The parameters and selections in the working area of the screen are configurations for that phase instance. Finally, the checkmark enables or activates the phase in this step.

5. To change the amount of “Matl 1” click on the set-point field and enter the desired amount ***‘195.3’*** in the data entry pop-up followed by ***OK***.

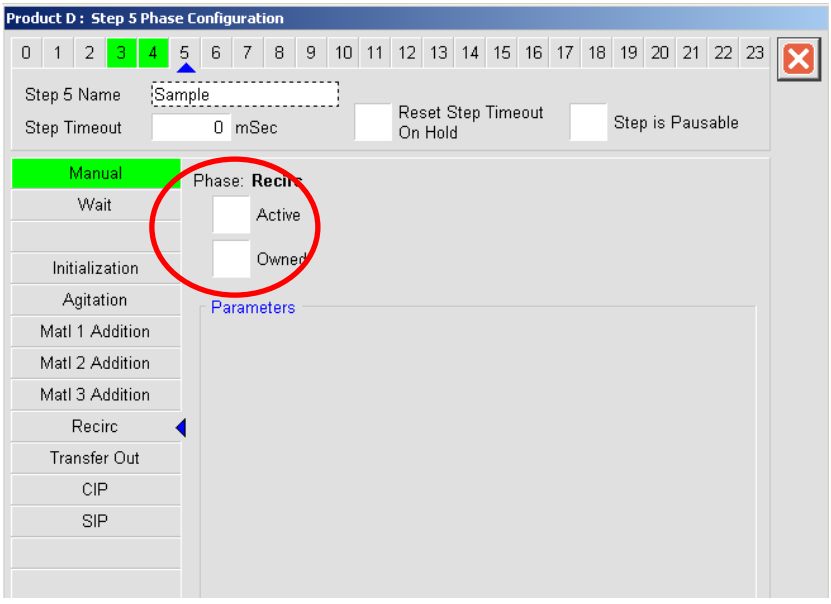


6. ***Close*** the “Step Edit” display by ***clicking on the red “X”*** in the upper right hand corner of the screen.

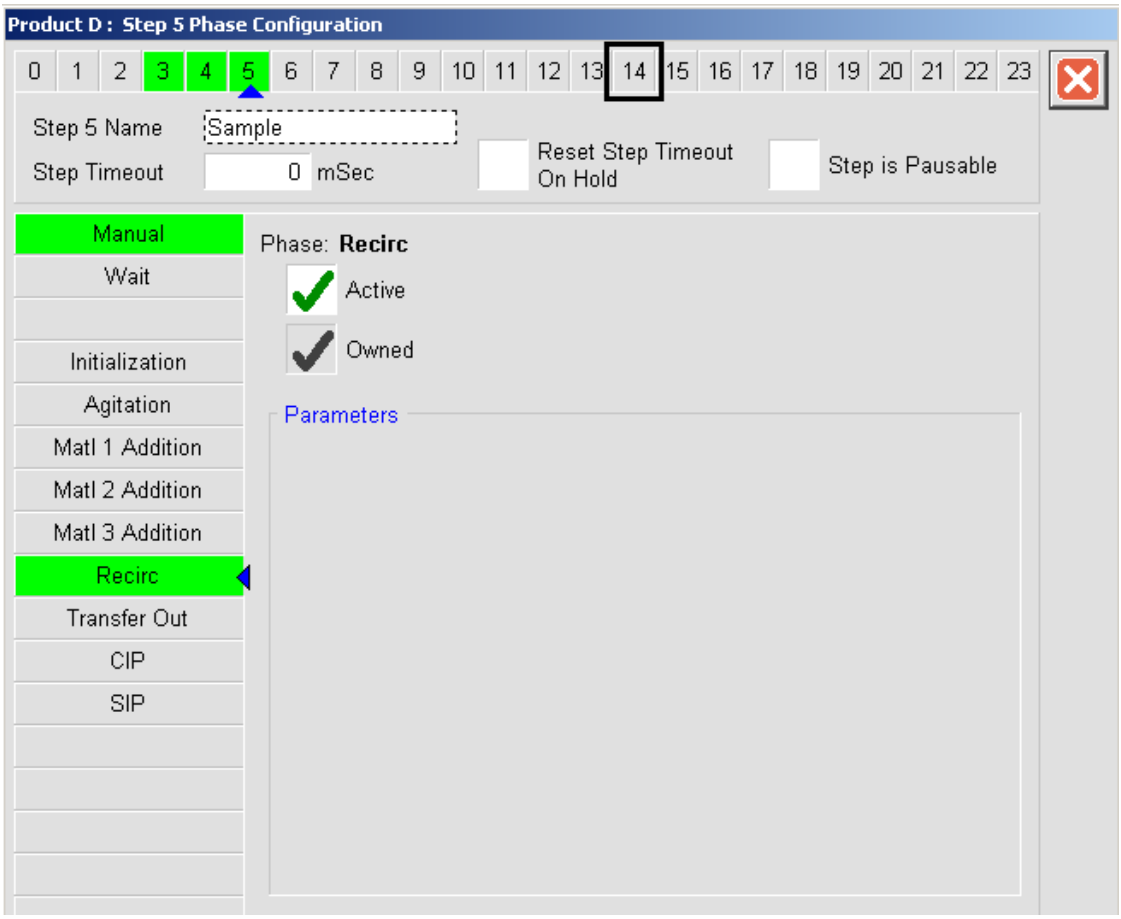
7. Now, let's address the second new requirement, which was, to continue circulating the tank's contents while a sample is being taken (which occurs in "Step 5."). Begin, as before, by ***clicking on the intersection between the "Recirc" phase and "Step 5."***



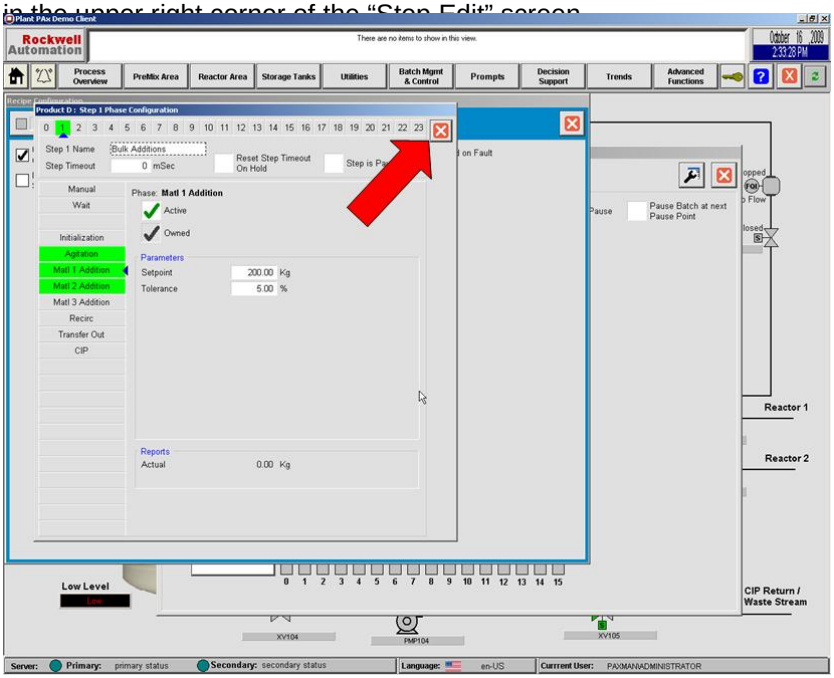
8. Check the ***Active*** box to enable this phase while in this step.



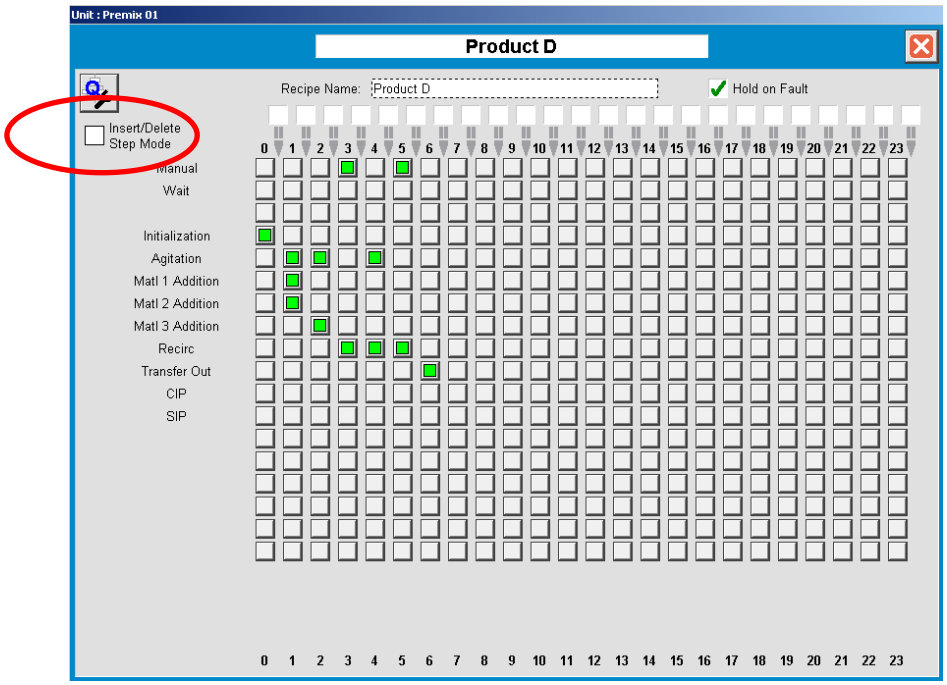
9. We have now completed the second requirement of adding circulation while the also sampling the contents. Note again the completed step and the significance of the various indicators on this display.



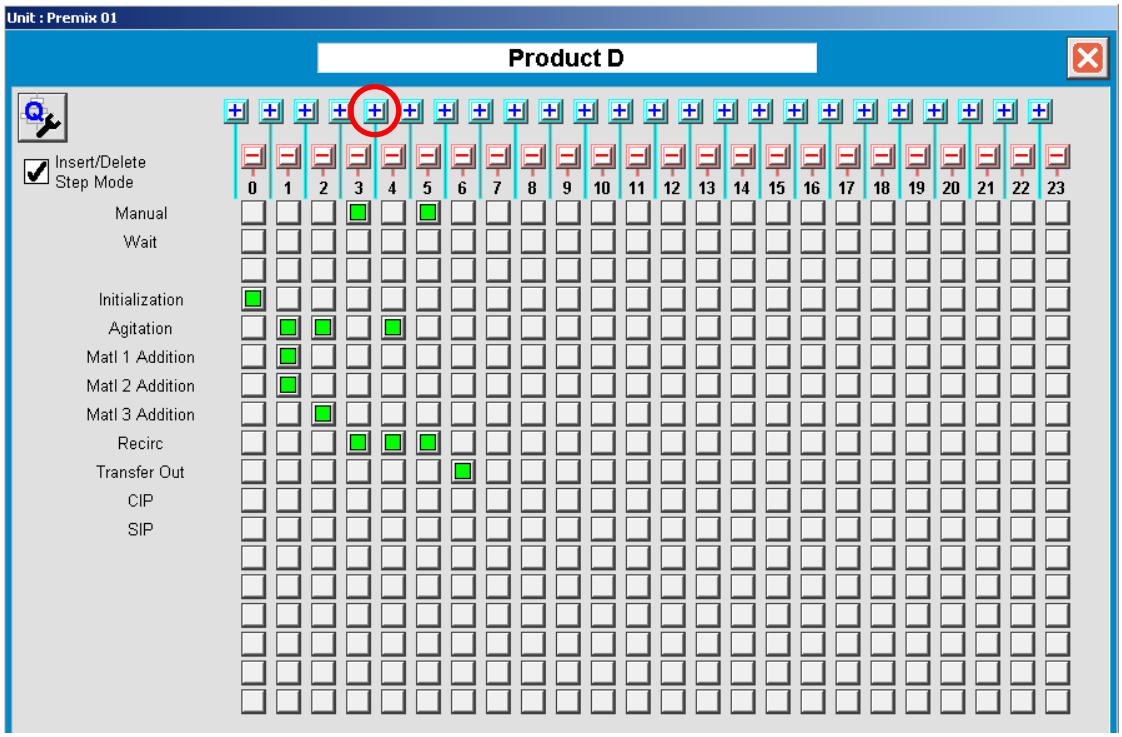
10. Close the “Step Edit” display and return to the “Sequence Edit” display by clicking on the red “***X***” in the upper right corner of the “Step Edit” screen.



11. For the third requirement, “Split the Material 3 Addition, before and after the Hand Addition,” we need to add a new activity between what is currently Steps 3 & 4. To insert a step, first enter the ***Insert/Delete Step Mode*** by checking the appropriate box on the “Sequence Edit”



12. Next insert a new step by checking the box between Steps 3 & 4.

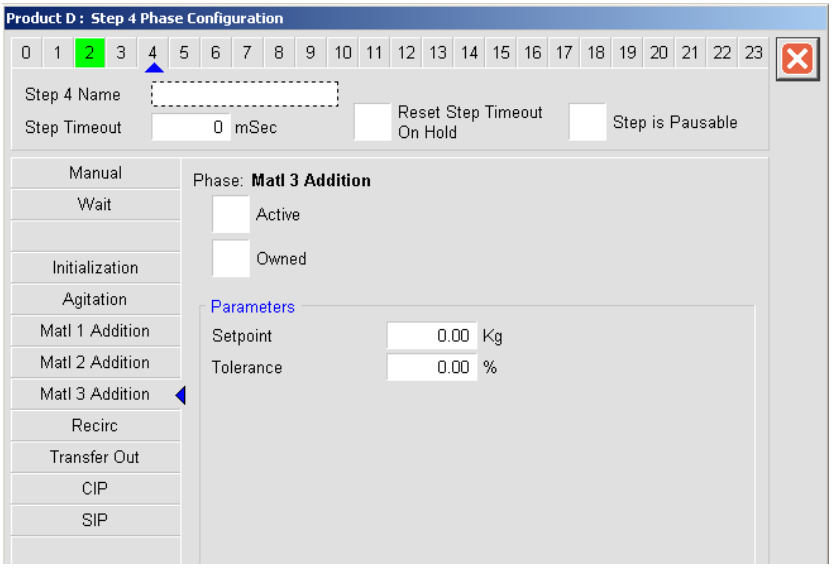


Note the position of the “+” and “-“ buttons. Selecting “+” will insert a step between two existing steps, while selecting “-“ will delete the existing step.

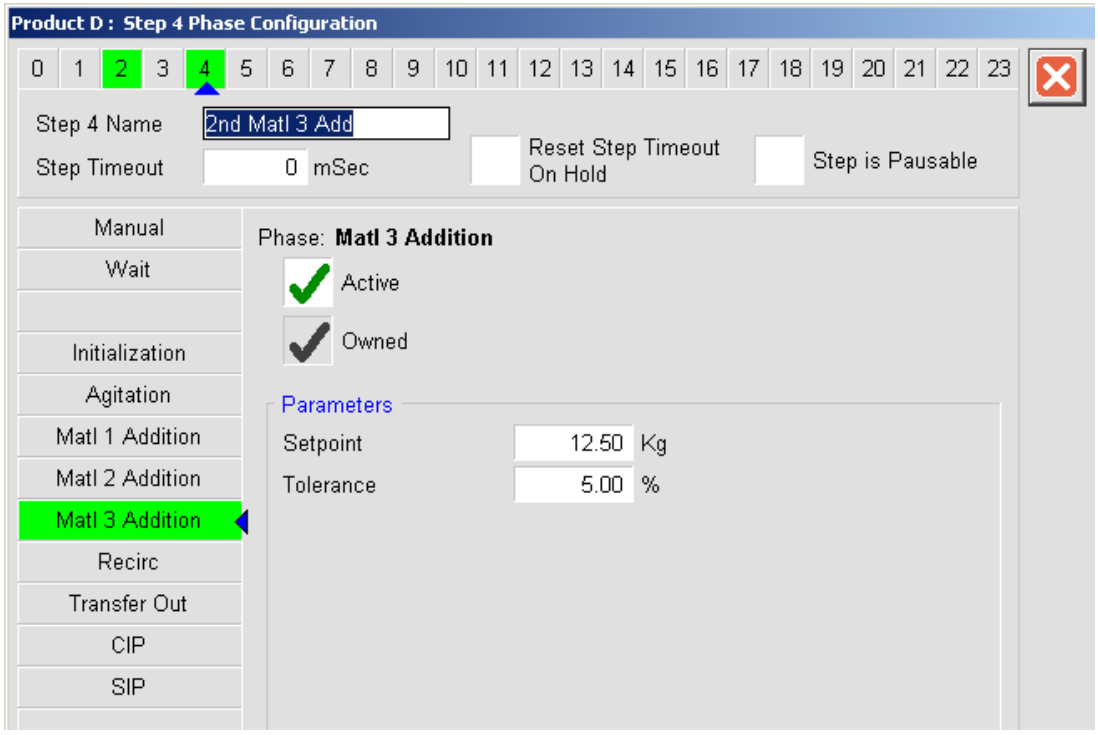
13. Click ***Insert***.

14. Add another Material 3 addition to the “new” Step 4, by clicking on the intersection between Step 4 and the Material 3 Addition phase.

15. Enable the phase, enter '***12.5'*** Kg and ***'5'%*** tolerance for the addition, and provide a "Step Description" such as ***'2nd Matl 3 Add***.'

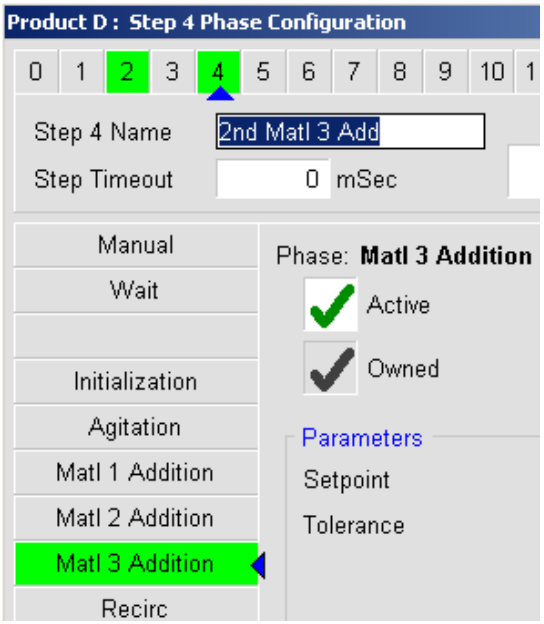


The completed step configuration should appear as follows:

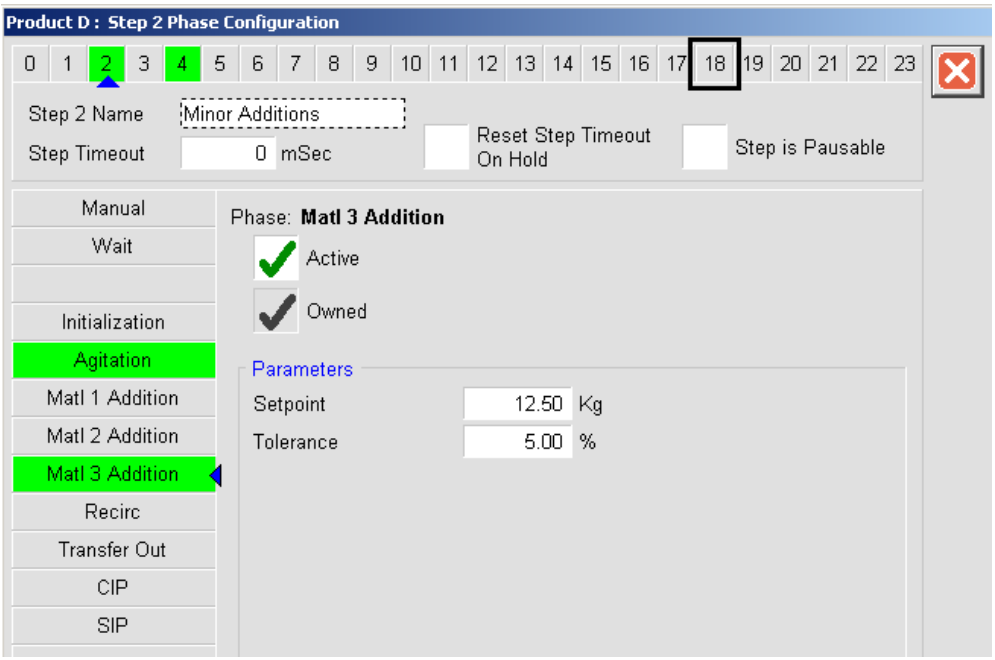


To save entries and edits, be sure to press '***ENTER***' while on the field. Alternatively, all entries can be made, then press '***PAGE DOWN***,' which will save all page edits.

16. Note, by the green highlight, that Material 3 is also added in Step 2. Click "***Step 2***" to change the amount of Material 3 added in that step.

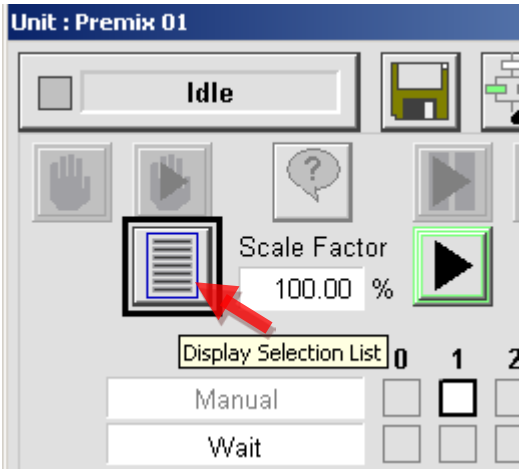


17. Change the amount of "Material 3" added in "Step 2" from 25 kg to ***'12.5'*** kg (since we are now adding the other half in Step 4). The completed step configuration should appear as follows.


Product D : Step 2 Phase Configuration
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Step 2 Name
Minor Additions
Step Timeout
0 mSec
Reset Step Timeout On Hold
Step is Pausable
Manual
Wait
Initialization
Agitation
Matl 1 Addition
Matl 2 Addition
Matl 3 Addition
Recirc
Transfer Out
CIP
SIP
Phase: Matl 3 Addition
Active
Owned
Parameters
Setpoint
12.50
Kg
Tolerance
5.00
%

18. Close the sequence edit windows and navigate back to the Premix 01 screen. Open the runtime detail screen by clicking on the magnifying glass in the bottom left hand corner.

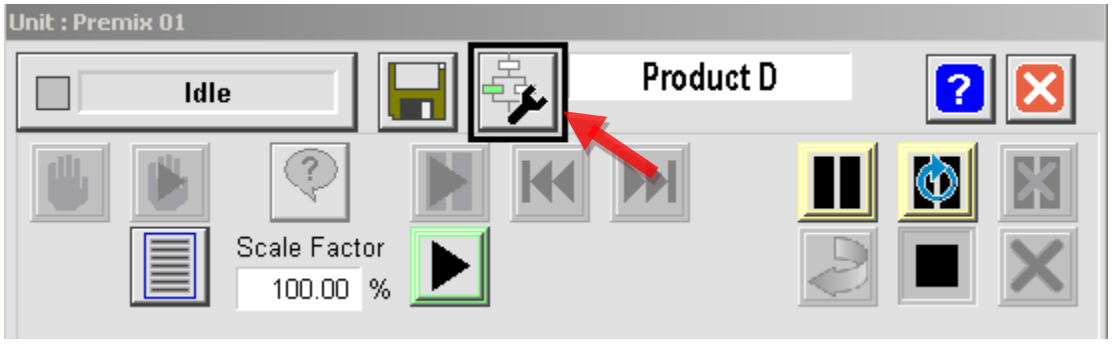
19. Select the "**Display Selection List"**, and from the popup select **Product D** to load the updated master sequence for the Premix_01.



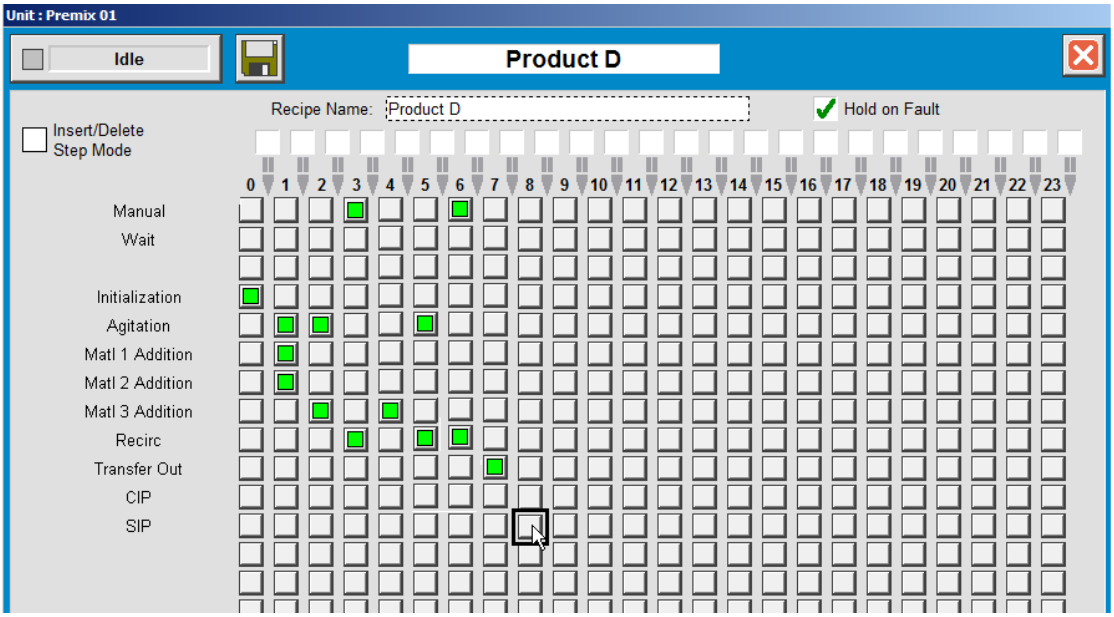
20. You should now see the 3 changes we just made in the newly loaded Product D sequence.

But wait! We forgot the 4th sequence change request which was to add the SIP step into the sequence! No problem, we will edit the runtime sequence and save it back to the master sequence.

21. Now, let's address the last new requirement, which was, to add an SIP step into the sequence (which occurs in "Step 8."). Select the **Edit the currently running sequence** button.

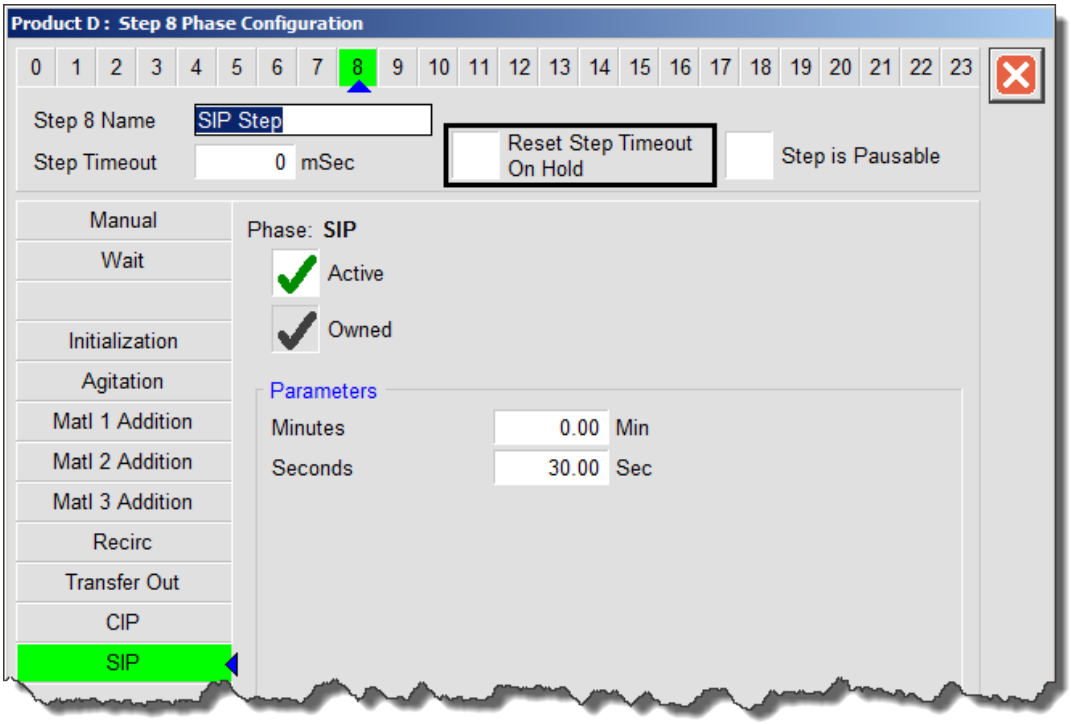


22. Begin, as before, by ***clicking on the intersection between the "SIP" phase and "Step 8."***



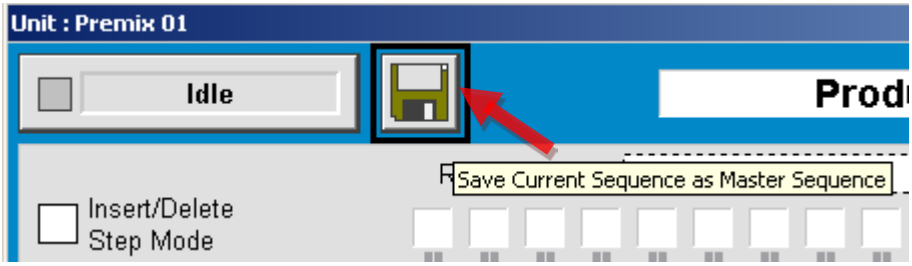
23. The blank step configuration window will appear. Change the Step name to "**SIP Step",** Select the **Active** checkbox, and enter a value of **30** into the Seconds Parameter field.

24. Press the **Page Down** key to download all changes on the page.

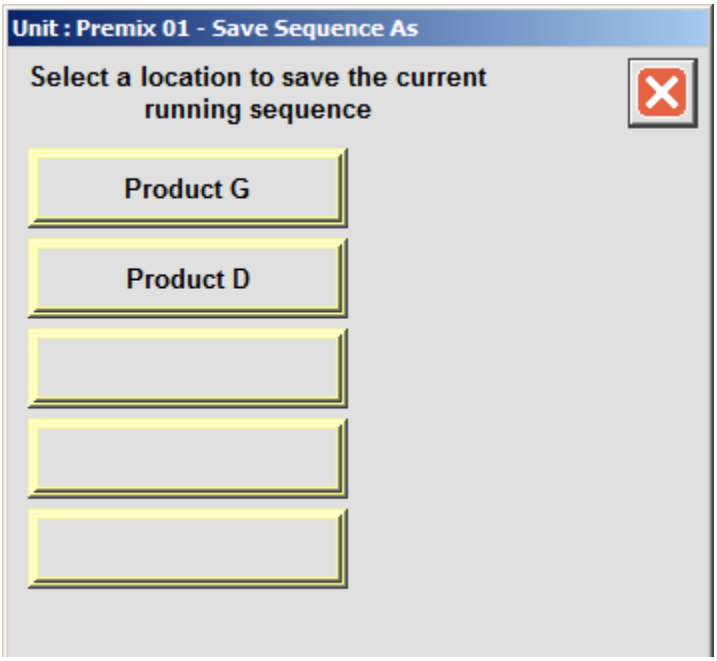


25. Close the window by selecting the **Red X**

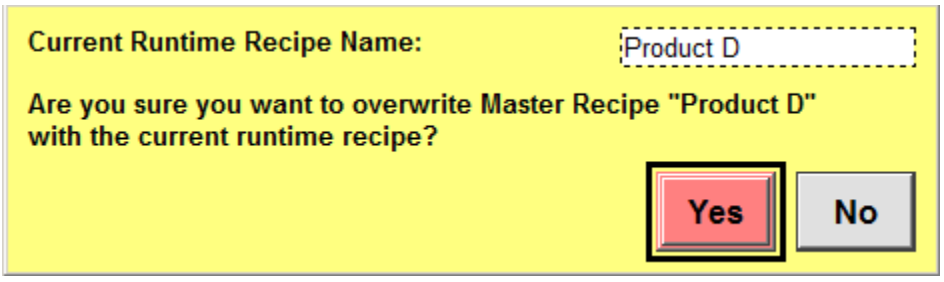
26. Now we need to save the runtime sequence back to the master sequence list. Select the **Save current recipe as master recipe** button.



27. Select **Product D.**



28. When prompted to confirm the save, select **Yes.**



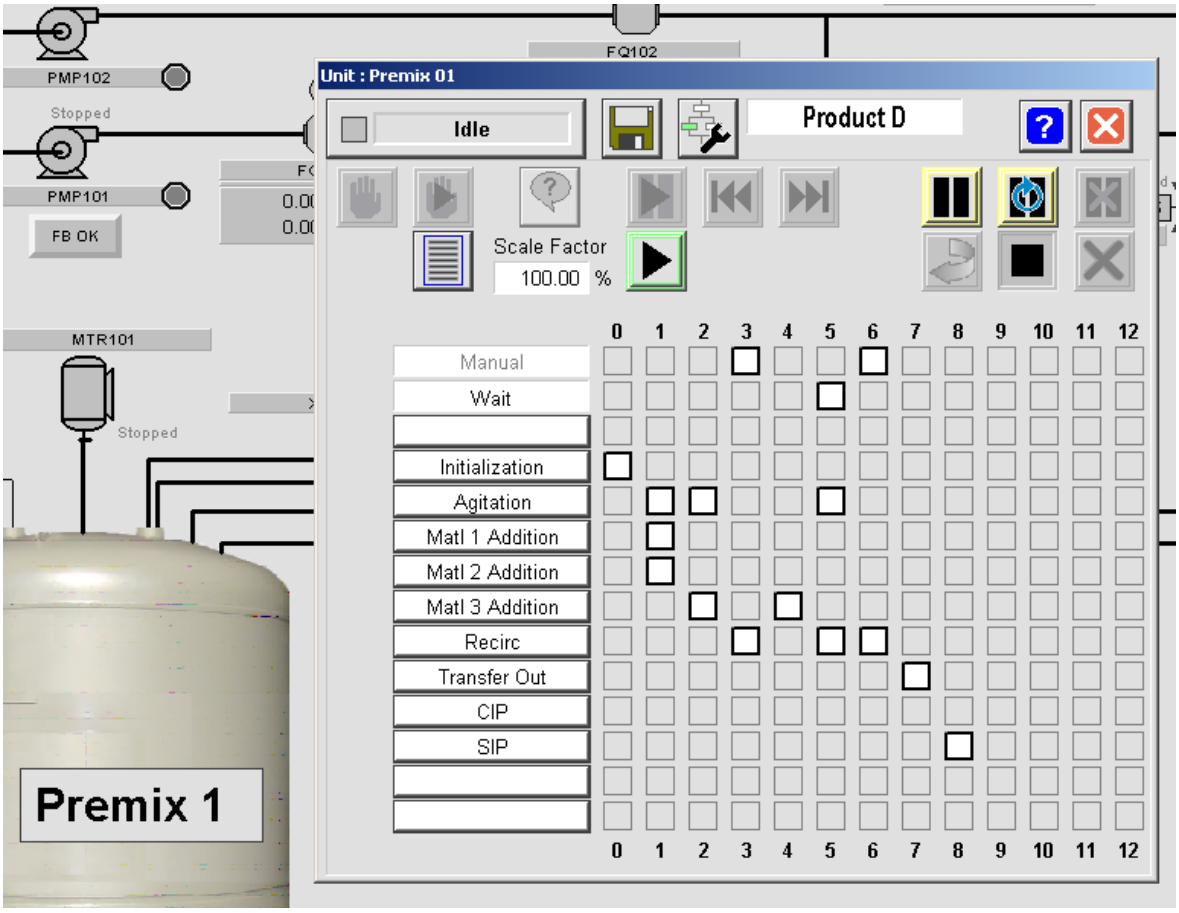
29. We are now ready to run a new sequence which would execute with the requested sequence modifications, those being:

a. Changing the amount of Matl 1 added from 250 kg to 195.3 kg.

b. Continue to circulate the tank's contents while also taking a sample in Step 5.

c. Adding a new step and splitting the Matl 3 addition between Step 2 and a new Step 4.

d. Added a new SIP step at the end of the sequence in step 8.



The R&D's (Recipe Author) Perspective is now complete!

If you choose, you can re-run the modified sequence by following the Operator's perspective and selecting the "Product D" sequence.

This completes this lab section on Logix Batch & Sequence Manager

LBSM Appendix:

LBSM Sample Application

If you have time and would like to look at the sample application that comes with LBSM when you download the files from technote AID 68709, follow these steps.

1. Close the FactoryTalk ViewSE client.
2. Close the open RSLogix 5000 project that we have been using for this lab.
3. Add a SoftLogix controller to slot 5 of the SoftLogix Chassis.
4. From RSLogix 5000 do a file open and go to C:\LBSM V1.5-01\Controller\Sample Projects\With Journal\LBSM_Sample_V1_5.ACD.
5. Download this project to the controller in slot 4, when done set it to ***Run***. Check the time.
6. Select ***Start*** and ***FactoryTalk View Site Edition Client*** and from the wizard select ***LBSM_Reporting.cli*** and ***Run***.
7. This will bring up FactoryTalk ViewSE project that comes with LBSM reporting.
8. From here you can run batches and enable reporting. Use Internet Explorer to look at the reports. Raise your hand if you have any questions.

LBSM and LBSM Reporting can be found on the Rockwell Automation Knowledgebase "Answer ID 62366 – PlantPAx Table of Contents

Appendix

Appendix

FactoryTalk Batch 11.01 Features

FactoryTalk Batch Equipment Editor

The following enhancements and features have been added to the FactoryTalk Batch Equipment Editor:

- The **Create Enumeration Sets and Enumerations** dialog box now includes a system provided REPORTING_CONTEXTS enumeration set. This enables the equipment author to add labels to the system-provided REPORTING_CONTEXTS enumeration set and then assign one or more Context IDs to a phase parameter or phase report. You can add, remove and edit enumeration set members to this enumeration set. The default enumeration is NULL, with an ordinal value of 0.

- The Equipment Editor now includes an **Accumulate definition for Integer and Real phase class report parameters** to accumulate the values uploaded to them.

- The **Edit Command Verification Policies** dialog now includes three new commands that can be configured for electronic signatures. The new commands are Force Transition, Override, and Override Clear.

FactoryTalk Batch Recipe Editor

The following enhancements and features have been added to the FactoryTalk Batch Recipe Editor:

Report parameters on operations, unit procedures, and batch procedures
A *report parameter* is a parameter holding a value resulting from the execution of a sequence or procedure. A report parameter on a recipe is expected to hold process data collected from the execution of the recipe's sequence of steps.
Report parameters on higher level recipes provide a simple way for process variables representing the execution of the whole recipe to be aggregated. The recipe itself can amass data in real time for analysis and reporting, thus simplifying reporting overall.

Appendix

Parameter expressions
A *parameter expression* is an arithmetic expression that may be assigned to a recipe parameter or report parameter of a recipe or a step at all levels of the procedural control hierarchy (phase, operation, unit procedure, batch procedure) where it is appropriate.

Aggregated report values
Phase report parameters now give you the ability to accumulate values uploaded by phase logic. This simplifies the reporting process.

Binding expressions have been updated to support:

- Absolute Value, Truncate, Round, Round Up, and Modulo math functions
- Referencing report parameters on parent operations, unit procedures, and batch procedures and peer steps within the recipe.
- Referencing data in the parent recipe's header.

Transition expressions have been updated to support:

- Absolute Value, Truncate, Round, Round Up, and Modulo math functions
- Referencing report parameters on parent operations, unit procedures, and batch procedures and peer steps within the recipe
- Referencing data in the parent recipe's header

Significant enhancements for reporting:

- Recording initial value of recipe parameters
- Recording the use of dependent resources
- Adding a reporting context ID to parameters
- Recording when a transfer of control is taking place

SFC validation improvements
Scalability of the algorithm that checks for possible problems in the construction of SFCs has been improved to find more problems in much larger SFCs.

Ability to bind a material-enabled unit without inventory
The recipe author now has the option of editing the unit requirement of a unit procedure to specify whether the unit is to be bound "By Inventory" as in previous versions of FactoryTalk Batch, or "By Configuration"; which relaxes the requirement for inventory to be identified as part of choosing a unit for binding. The FactoryTalk Batch Server and FactoryTalk Batch Material Server will determine the appropriate set of binding candidates at runtime.

Recipe printing functions have been enhanced to include procedure reports and parameter expressions.

Appendix

More Features are detailed in the Getting Started product manual.

Appendix

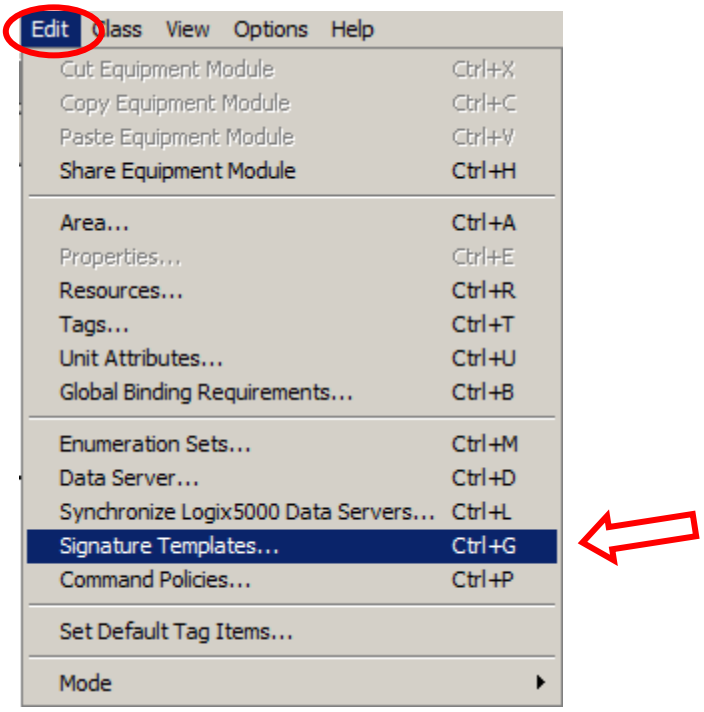
Exploring New Command Policies and Operator features

Let's explore the **Command Policies** feature which includes three new commands that can be configured for electronic signatures. The new commands are Force Transition, Override, and Override Clear.

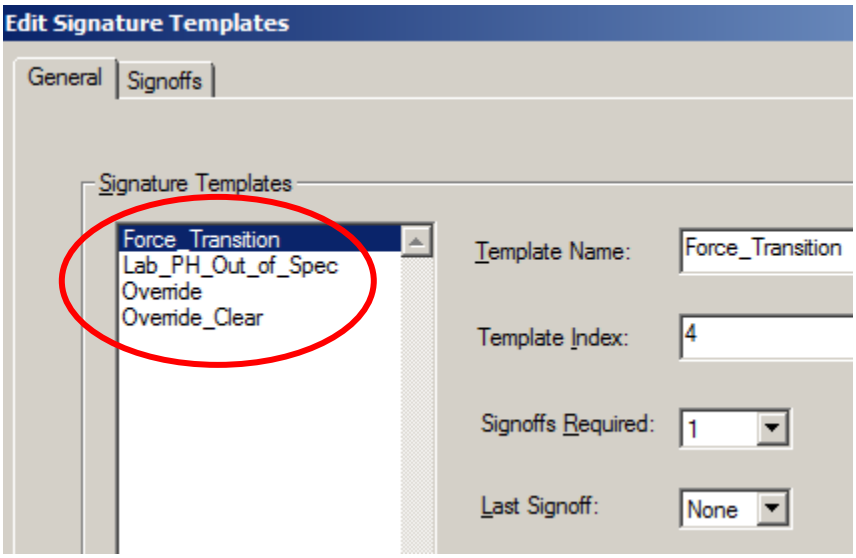
These new policies provide functionality that can be very helpful to production during abnormal circumstances with the process or the instrumentation. However, a complete understanding of these features combined with extreme caution should be exercised when applying these features in the plant. These policies should not be taken glibly, so we have assigned electronic signature security to each in the following example.

Notice that there are 3 signature templates that we created previously – one for each of the new command policies. For convenience, we have chosen to name the signature templates with the respective name of the command policy it will be assigned.

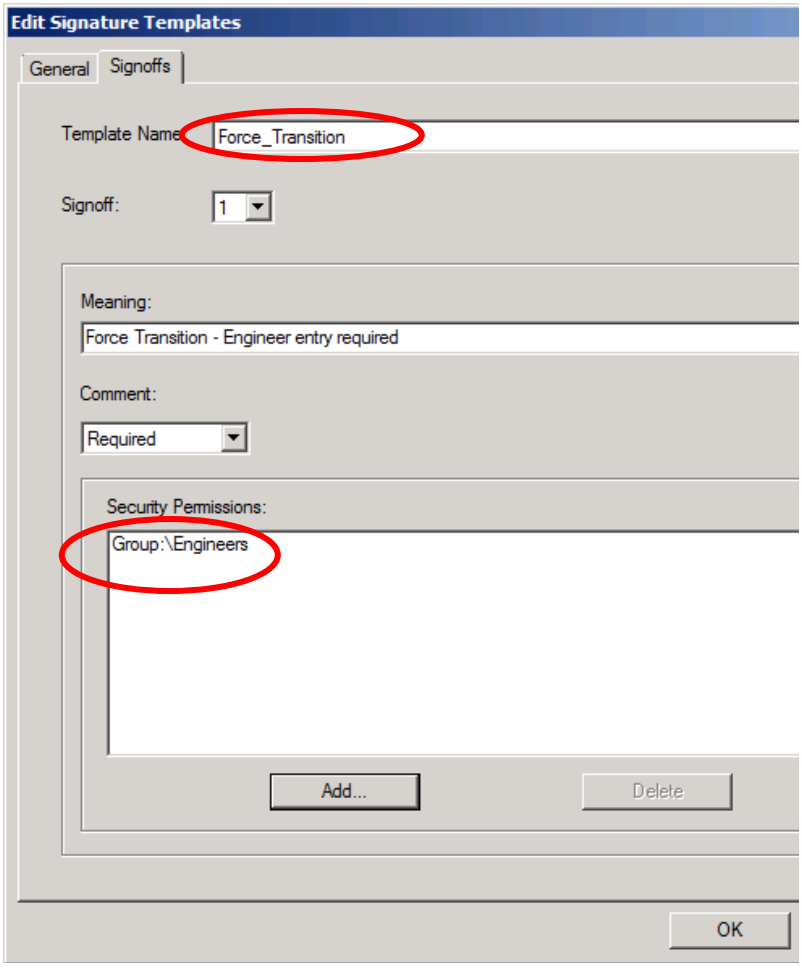
1. Within the Equipment Editor, select menu Edit -> Signature Templates...



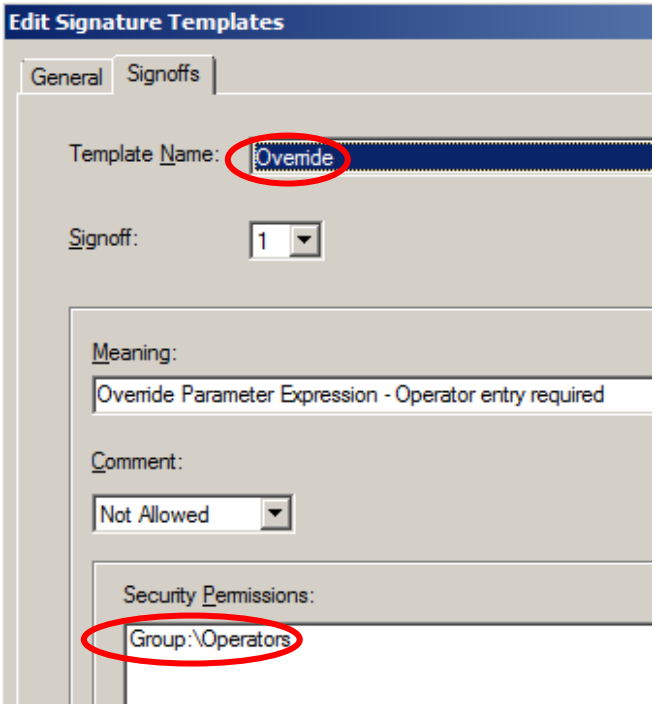
Observe the three signature templates named, Force_Transition, Override and Override_Clear.



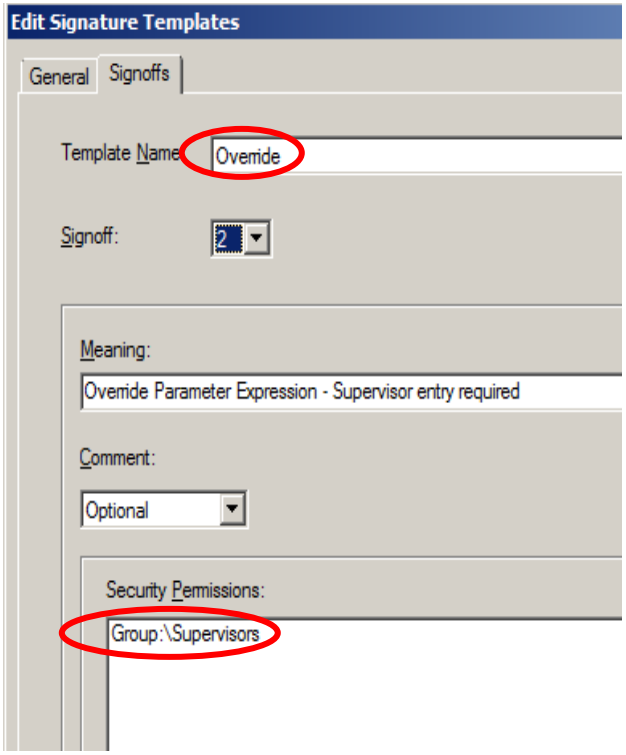
Force_Transition will require 1 sign-off from anyone a member of the Engineer group as shown below:



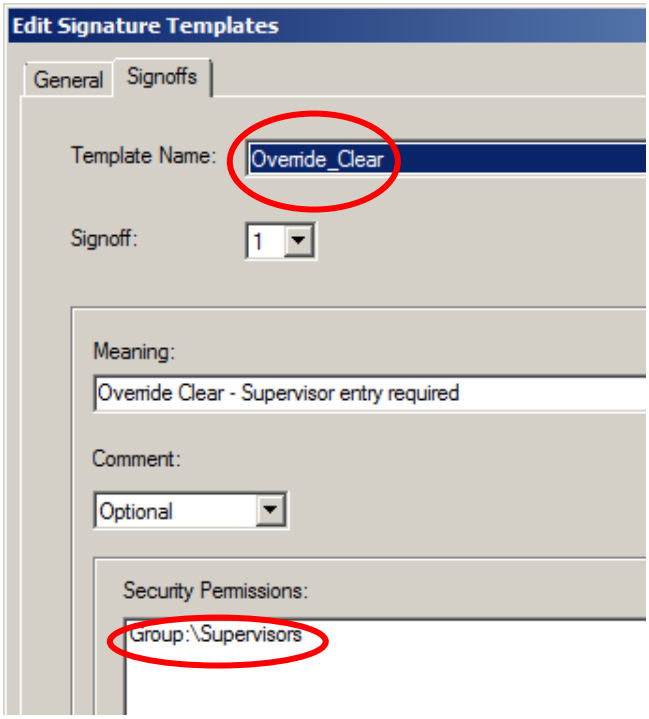
Override will require 2 sign-offs. One user from the Operator group. Another, the second user, from the Supervisor group. Both are shown below:



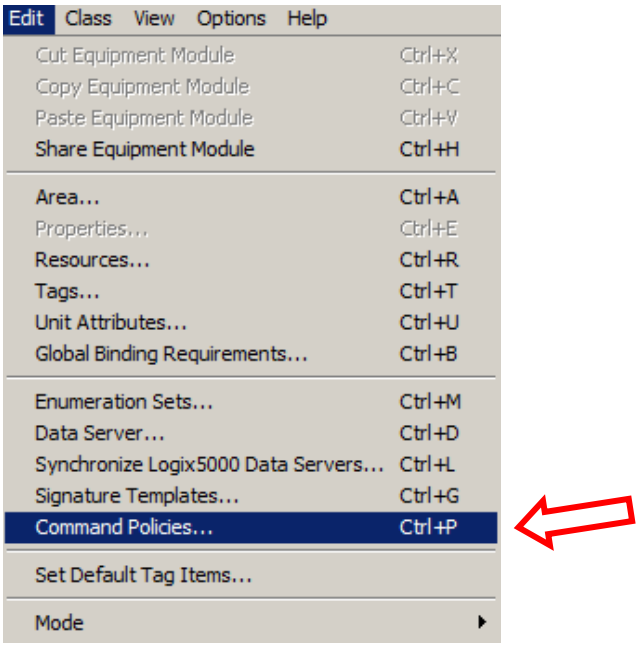
Supervisor Group…



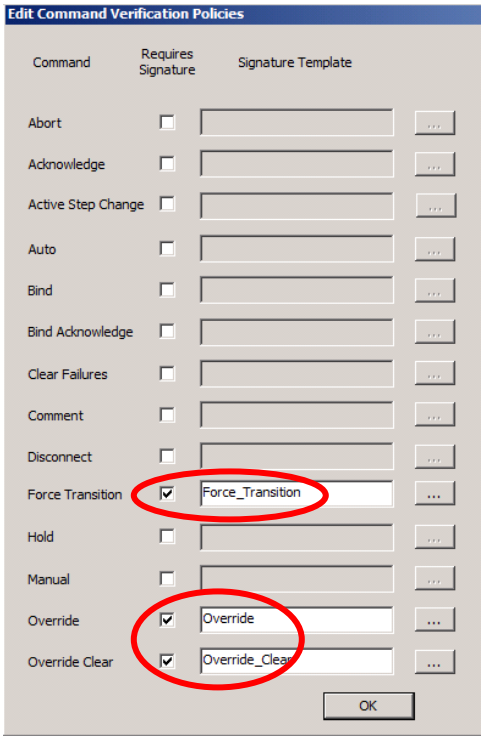
Override_Clear requires 1 signature from a user in the Supervisor Group.



2. Notice that we have assigned a signature template to each new command policy feature. Within the Equipment Editor, select Edit->Command Policies...

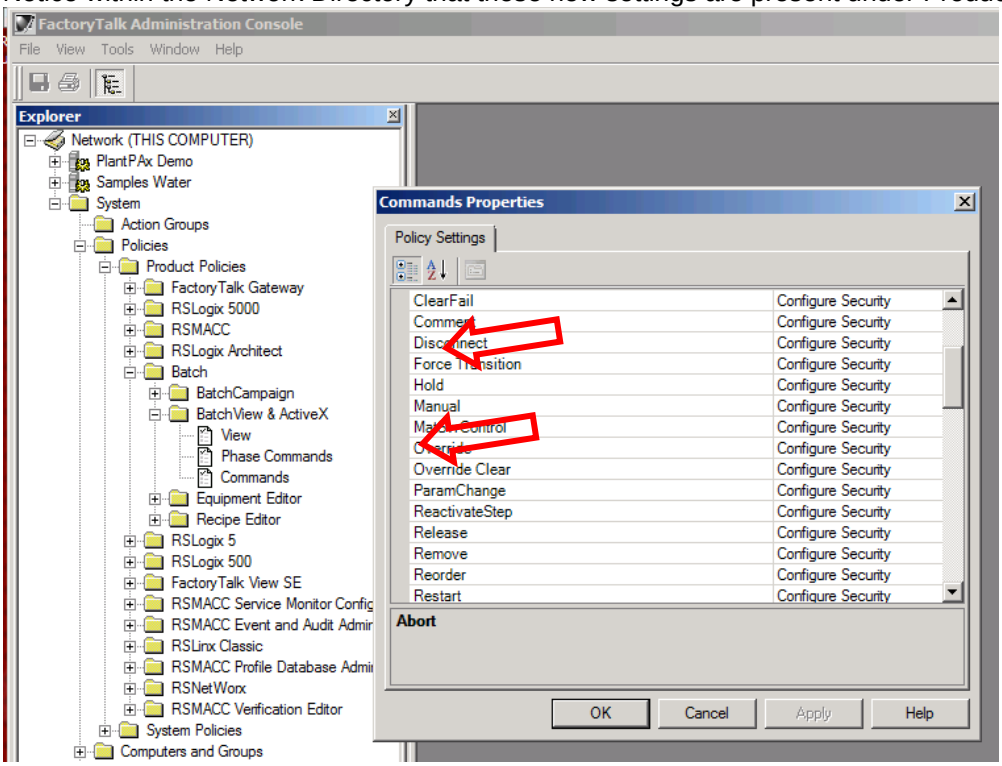


Observe the boxes that are check marked to the right of the policy to enable them.



Select OK when done.

3. Notice within the Network Directory that these new settings are present under Product Policies:

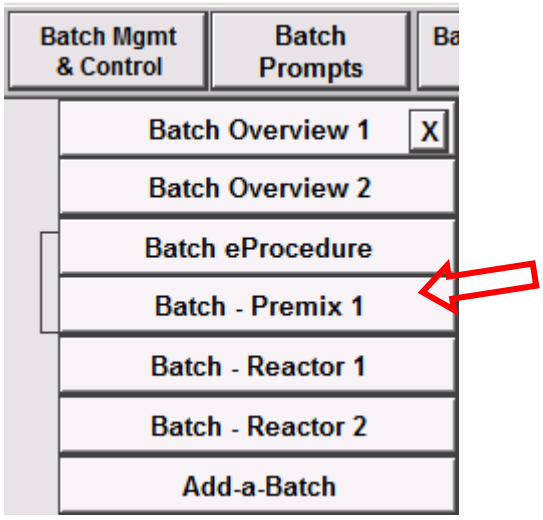


This screen is brought up using the FactoryTalk Administrator Console to connect to the Network directory.

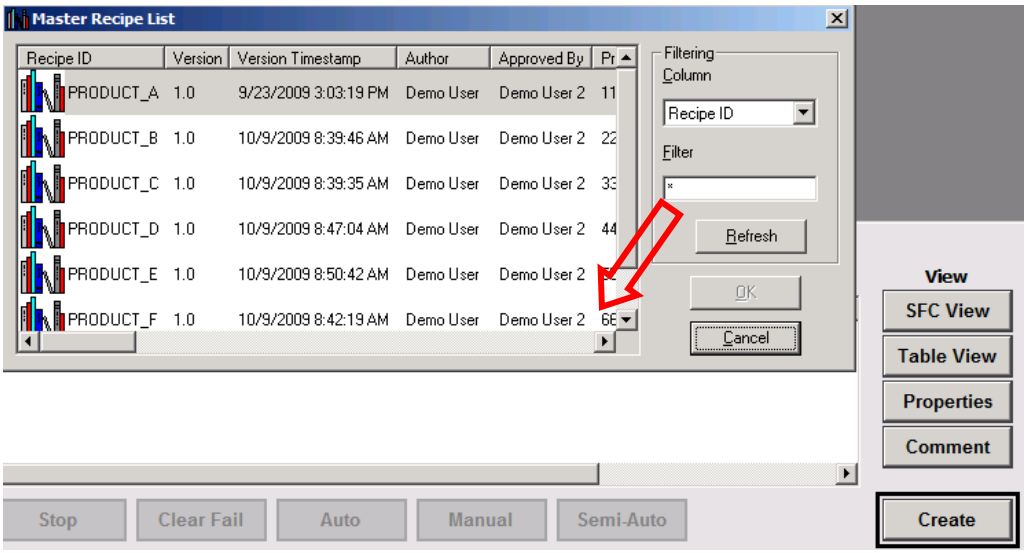
Please note: With FactoryTalk Batch version 11, you should run a post-install update for the FTSP policies using a bat file after completing the installation of the batch product. This update will create the new product policies inside the FactoryTalk Directories.

4. Now let's switch over to production to see how an operator might use the Force Transition command policy. This new feature allows you to easily force a transition to fire so the recipe sequences without the need for an Active Step Change. You will run a recipe called **Z_Force_Transition_OP**.

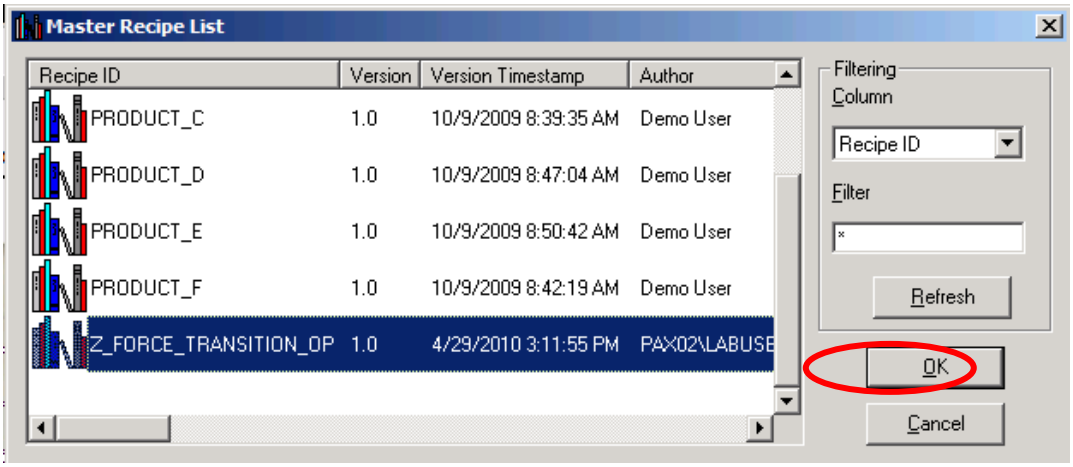
From the Batch Mgmt & Control overview, select Batch Premix 1



5. Select the Create button on the screen. This generates the Master Recipe List. Scroll down the list to the bottom.

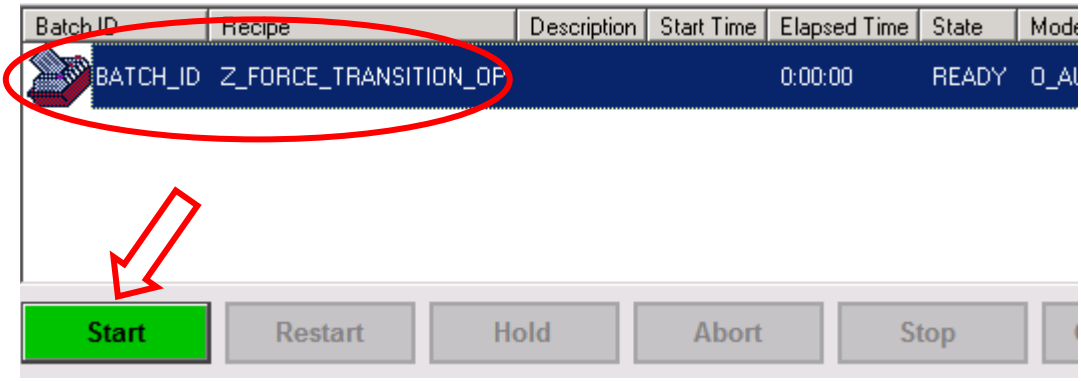


6. Select the recipe named Z_Force_Transition_OP Select OK.



7. When the Batch Create Window comes up, select OK to add a batch to the list.

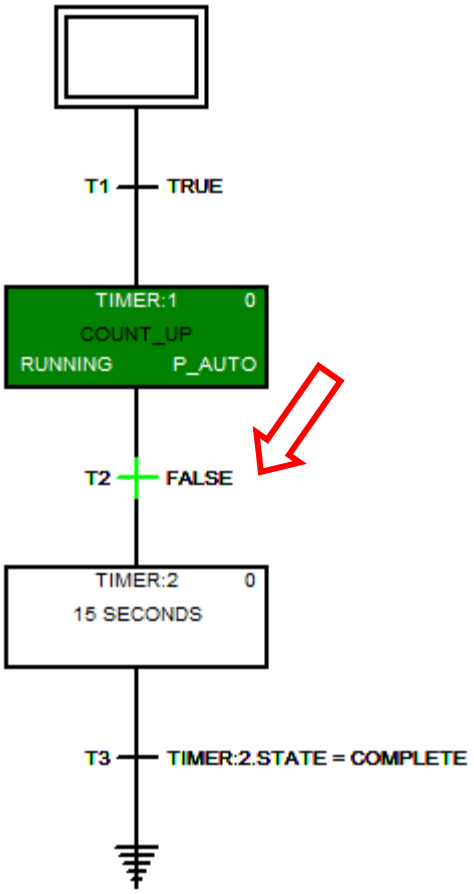
8. Select the new recipe in the list, and issue a START command to the control recipe.



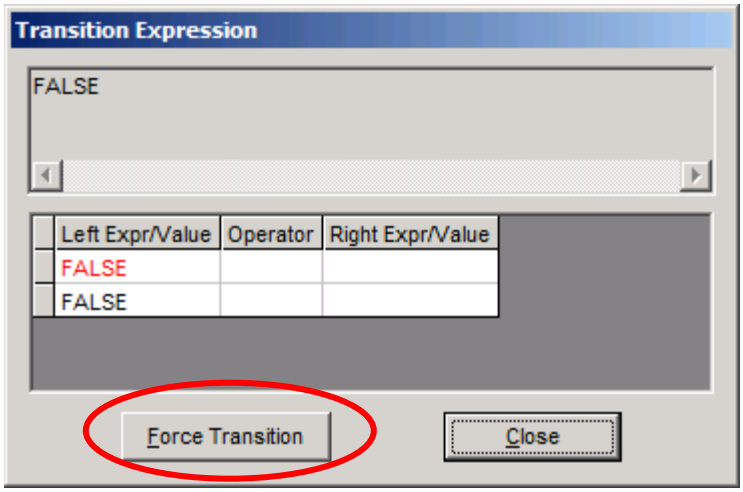
9. Select the SFC View button,

and right-mouse click in the SFC to select the ZOOM property setting it to 75%

10. Notice the transition will never go true under the built-in Timer step. This step will count up in minutes indefinitely. The transition is a static FALSE for the illustration of this new feature. However, this could be analogous to a faulty instrument reading, or a process condition that may never be reached to unexpected process conditions. In such a case, the Force Transition command policy will allow you to change the Boolean expression result of False to True. Once True, the batch server will fire the transition so the recipe will sequence to the next step without the need for an Active Step Change.

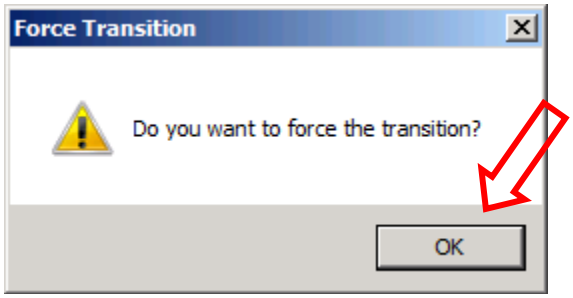


11. Double-click upon the T2 transition. The transition expression window will launch.

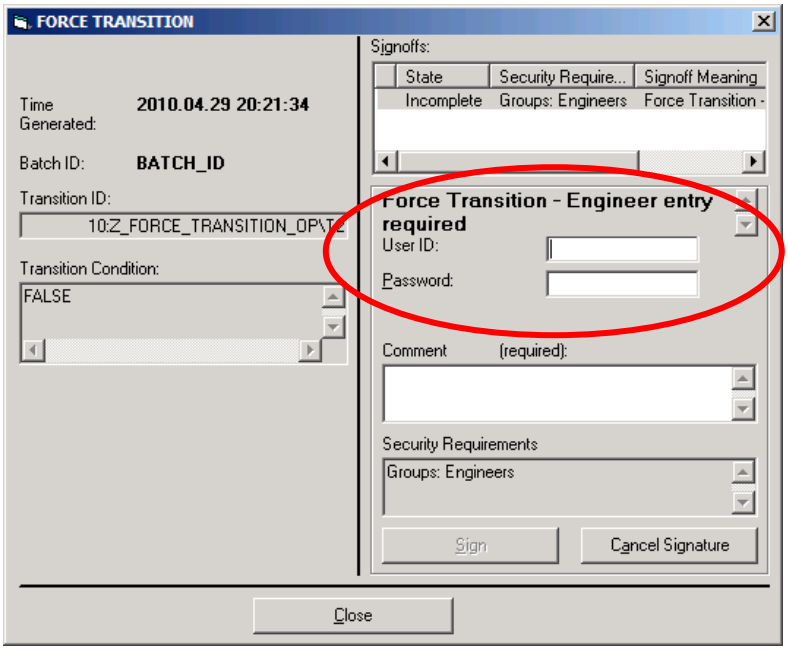


Notice the Force Transition button.

12. Select the Force Transition button. Select OK to the prompt:



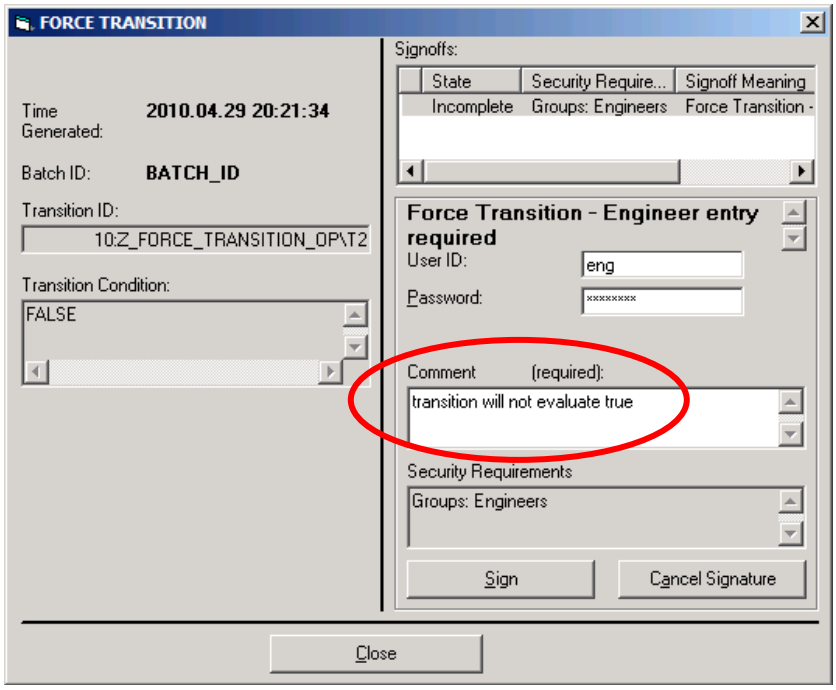
13. The electronic signature security window will launch.



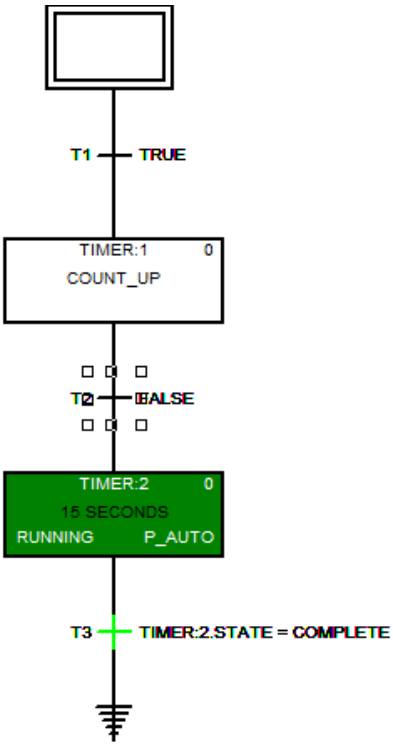
You will need to login as a member of the engineer group users to cause this action to occur. Use the following logon:

User ID = **Engineer** Password = **Engineer**

14. Since a comment is Required in the signature, you must enter some information about why the Force Transition is about to take place. The sign button will not become active until you type something into this required box.



15. Select the Sign button to complete the action.
16. Notice that the recipe has moved onto the next Timer step.



This Timer:2 phase step will Complete in 15 seconds as determined by its set point, and Countdown.